Design News

Nitrogen-sealed cantilevers withstand 10 million operations.

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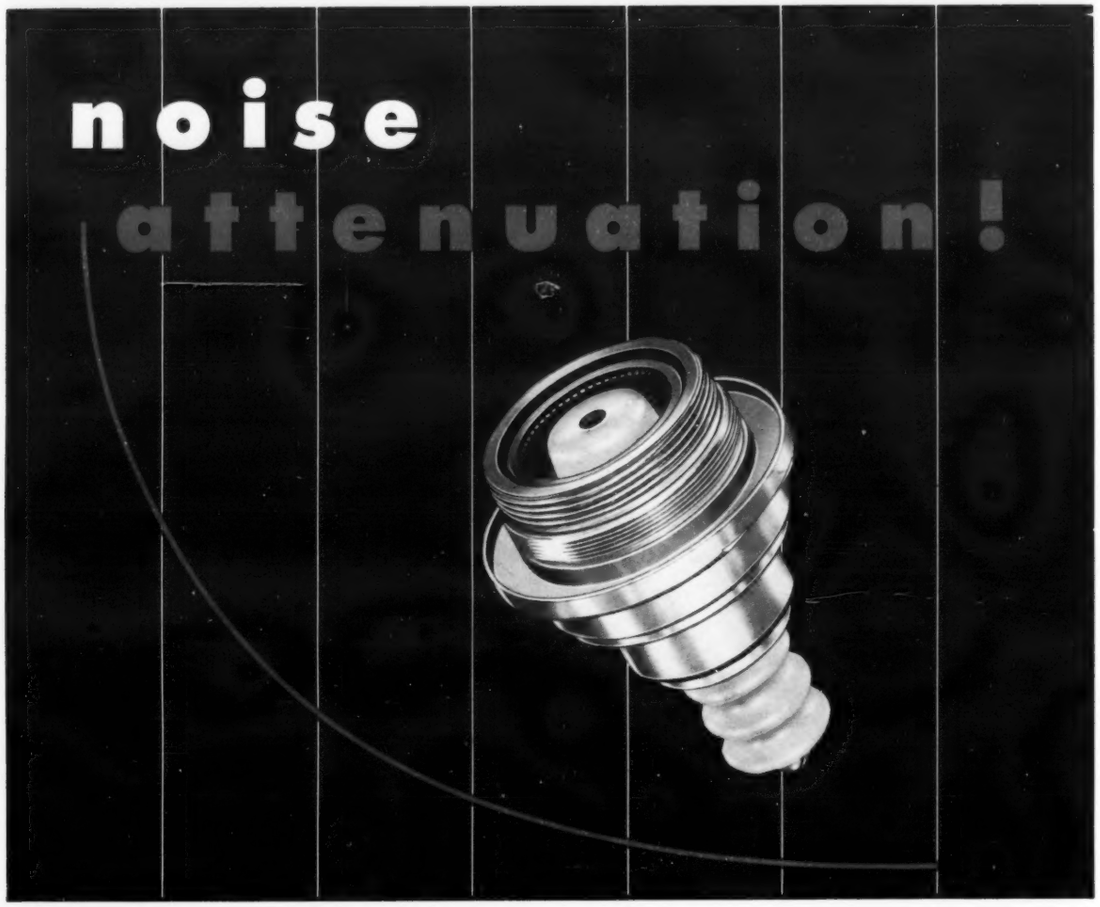
MARCH 27, 1961



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NBP March 27, 1961 Vol. 16 No. 7 BPA
Worldwide Coverage of Technical

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DESIGN NEWS

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SOUNDING BOARD

FOR OUR READERS

Safety—Concern of All Engineers

I would like to congratulate you and your correspondents for the vigorous stand that you have taken in recent months in behalf of automotive safety.

Safety should be the concern of all engineers. When a leading engineering publication takes a stand on this vital issue, it performs an outstanding public service. But, it also is helping to create an image of the engineer as a professional man in the public mind.

In a recent issue, I read the comment that you had not received an official reply from any spokesman of the automotive industry. If you refer to the Dec. 15, 1960, issue of "Automotive Industries" magazine, you will find a blanket condemnation of your recent editorial policy. This is in the column entitled "Observations", by Joseph Geschelin, which may be your reply.

In reply to the letter from the public relations department of Chrysler Corp. in regard to "spears" on cars, there was a review of medical literature on this subject in the Consumer's Research Bulletin concerning deaths caused by automobile ornaments. The same magazine also reported that the Swiss government prohibited the importation of automobiles with such ornaments into the country until these projections had been removed.

SAMUEL A. BALKAN
Consulting Engineer
Waban, Mass.

• Yes, Mr. Balkan, after reading the column you sent me, I would agree this must be the auto industry's reply. For the benefit of readers who didn't see this "pale paint job", here are excerpts from Mr. Geschelin's "Observations":

"A simple review of current car design will show that the present cars, as well as earlier generations of cars, are about as safe as they can be made. . . .

"We have safety glass . . . (Editor's note: See following letter.)

"So much attention has been devoted to whipping designers that only a few have given thought to making driving safe on the streets and highways. . . .

"Let's not look at the car as a dangerous tool that will rear back and kill you.

"Above all, let's resolve that before anybody writes about safety, particularly if it is a technical writer, that we check first with people who know so we may be informed as to the state of the art."

On page 6, Bob Candlish gives his "Observations". Prior to joining the DESIGN NEWS editorial staff as a full-time resident engineer-editor, Bob Candlish, Detroit Editor, spent 20 years as a working designer (7 as a member of management) with one of the top automobile manufacturers. We feel this gives Bob at least the basic fundamentals on the state of the art. E.R.C.

'Tempered' Glass

We have followed with interest your recent editorials, articles and reader comments on the subject of auto safety.

With 1961 models, the entire auto industry, with the possible exception of GM Cadillac Div., has completed a change-over to the use of single-thickness, heat-treated glass in all areas except the windshield.

We contend this is a serious compromise with safety, and we believe we can establish it was done for profit motives.

Our case against heat-treated glass, commonly known as "tempered" glass, is documented in the attached "Book of Facts" which I hope you will have time to read and perhaps review briefly in your columns. . . .

JAMES R. TURNBULL
Program Director
Laminated Safety Glass Committee
The National Auto & Flat Glass Dealers Assn.

Your editorial, "Auto Safety—a Record", in the Nov. 7 issue of DESIGN NEWS was a clear-cut statement of the facts and is to be applauded. This is one subject everyone shies away from.

Are any reprints of this article or this issue available? Mine was taken by the vice president of the bank.

Thanks for your excellent publication.

M. W. GETLER
Pres.
Alloy Flange & Fitting Corp.

• Reprints sent, but watch that bank V.P. E.R.C.

Company to Company

A common complaint is summed up by the following quote from a third letter of request for information to the engineering V. P. of a prominent manufacturer. It was sent to me by a reader on the West Coast.

"It is too bad so many good ideas must be abandoned, as mine will be, due to the fact that manufacturers apparently do not feel any obligation to correspond with individuals. I will agree that the profit return in some cases seems rather remote, but do manufacturers ever consider that many of us work for engineering firms and we are the ones at whom the advertising and the deluge of available literature are directed?"

I cannot say that this is a general or even widespread condition. However, I do know that many manufacturers are somewhat less than enthusiastic about corresponding with individuals as individuals.

Every company doing business has the right to screen and select its potential customers. In many cases it is necessary to limit dissemination of information to some degree.

This is true, for economic reasons, with DESIGN NEWS. A complimentary copy of DESIGN NEWS is sent only upon written request on company letterhead. (See bottom of page, inside back cover.) It is available, however, to anyone on a subscription basis.

I question the wisdom of a policy, formal or by indifference, of polarizing to permit only "company to company" communications. People get things done.

The strong individual with sound ideas often needs information to develop and prove those ideas. He may or may not occupy a comfortable niche in a corporate organization chart.

No one questions that a large percentage of products available today did not exist 10, 15 or 20 years ago. This is accepted. By going below the surface a little deeper, we find that many of the companies supplying these products also were not in existence 10, 15 or 20 years ago.

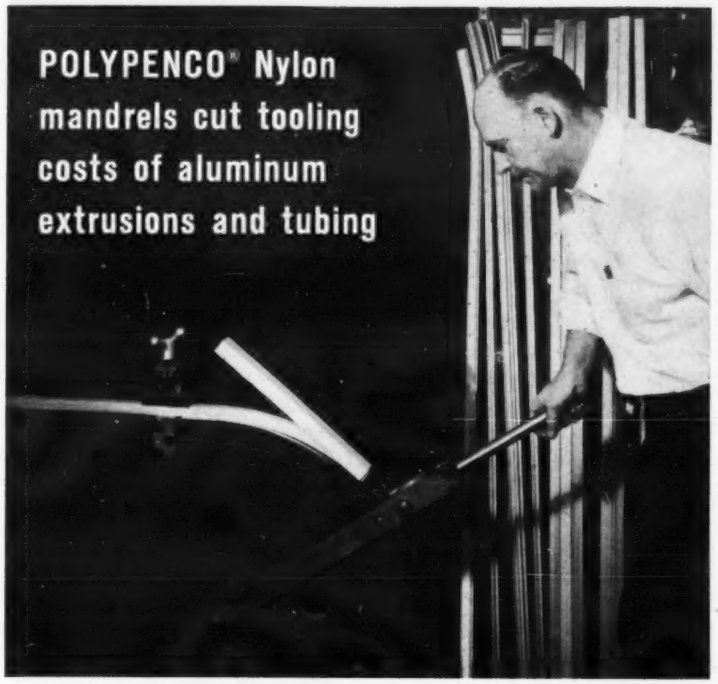
The United States industrial complex is not a close corporation of existing companies. New businesses conceived with an idea and born of man's labors come to life daily. The mortality rate during the early period is high. But those that survive today grow up to become tomorrow's citizens of industry.

Communication of information from manufacturer suppliers can perhaps be likened to the cow's milk—vitally needed by the one-day-old calf, not quite so essential to the yearling steer. Many manufacturers may be overlooking a new-born maverick that can grow up to be a real "fat calf" with proper feeding.

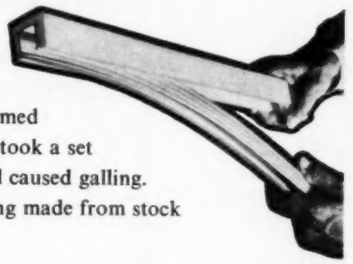
One thing is clear, effective communication is not made "company to company"—rather it is a "people to people" matter.

Ernest R. Cunningham

Editor



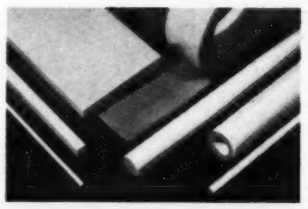
Economical POLYPENCO Nylon Stock Shapes replaced steel and bronze mandrels in the production of aluminum awnings . . . at considerable savings.



Each custom-made awning required four separate 17-inch radius bends, pre-formed at the factory or formed in the field. Steel mandrels eventually took a set while bronze picked up aluminum and caused galling. Both problems were solved with tooling made from stock shapes of POLYPENCO Nylon 101.

To solve your tooling problems—consider tough, wear resistant nylon, the industrial plastic which will not gall or scratch mating surfaces. Low surface friction without lubrication, resilience and ease of fabrication are added property premiums to give you longer part life, improved quality and lower costs.

POLYPENCO Nylon Stock Shapes (600 sizes in more than 14 nylon formulations) are available from stock in all major cities. For details or technical help call your nearby Polymer representative.



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DESIGN ENGINEERING NEWS

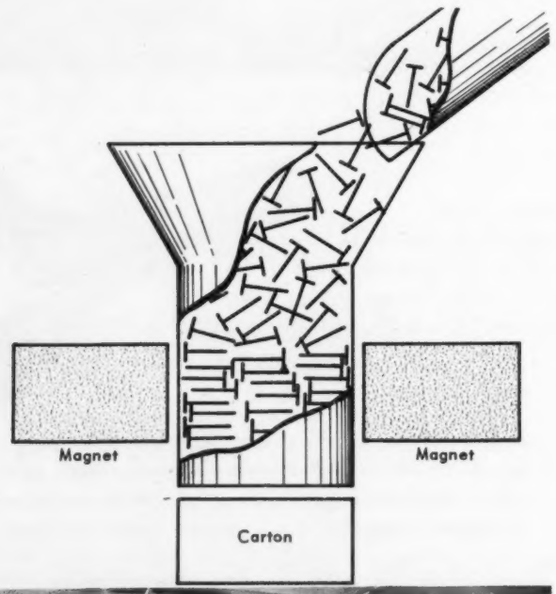
Packaging Line Magnetically Arranges Nails in Cartons

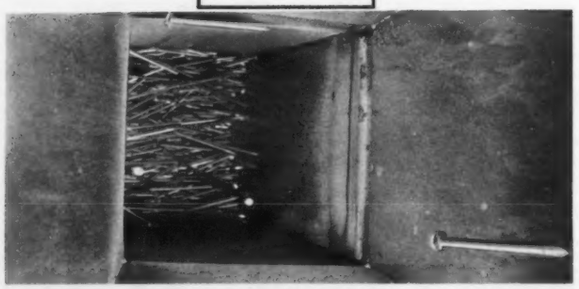
Paul R. Taylor, Assistant Editor

PUEBLO, COLO.—Waste motion has been reduced greatly with a nail cleaning and magnetic packing line, a design development of the Colorado Fuel and Iron Corp., Wire Mills Nail Dept. The system offers cleaner nails with sharper points, neatly packaged in a compact carton.

Fresh from the cutting machine, nails in bulk are dumped into a hopper where they are fed by a magnetic conveyor to a point approximately 12 ft above the floor. Here the nails begin a downward trip, falling into the tumbling drum that gently "rumbles" small pieces of steel left clinging to their points. From the drum, nails feed into a tri-chlorethylene wash, where grease is removed. This chemical bath produces clean nails, eliminating smudge marks sometimes apparent in finishing work.

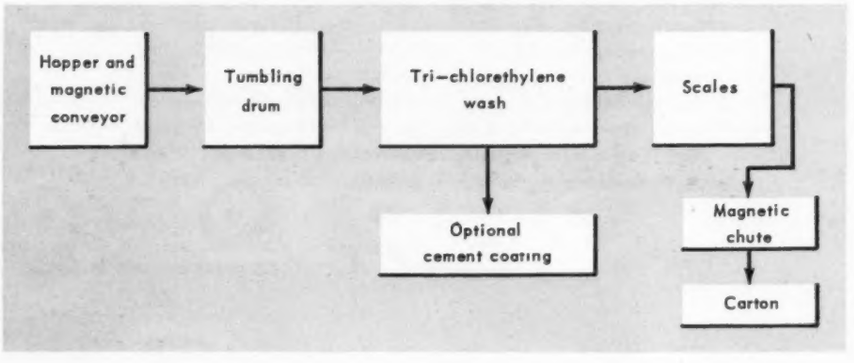
From the cleaning bath, nails fall into a preset scale and are measured in exact amounts (usually 50-lb quantities). They then are dumped through a chute where nails begin a free fall through a magnetic field. Two electromagnets, one on each side of the chute, compel nails to line up. While nails are suspended in chute, a momentary reversal of current destroys magnetic field, demagnetizing nails and permitting them to fall neatly into a carton.





NAILS, weighed to exact quantity, free-fall through magnetic field, hang suspended for brief moment before current is reversed. Chute will accommodate nails up to and including eight inches.

MAGNETICALLY PACKAGED NAILS in their small, easy-to-open and reclose carton.



Chip-Conveying Teeth on Saw Permit Rapid Bone Cutting

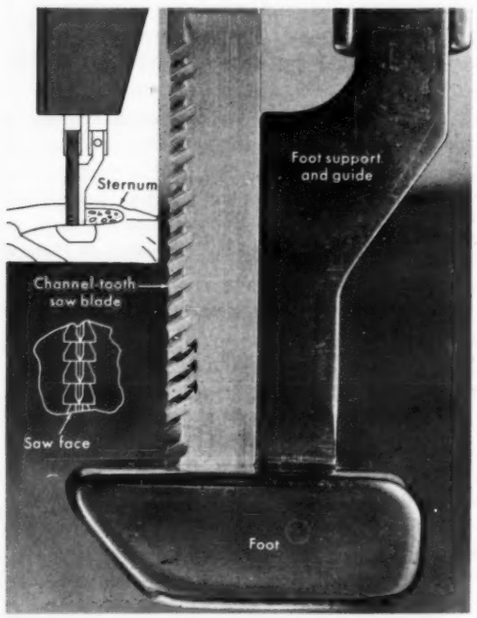
Robert L. Candlish, Detroit Editor

ANN ARBOR, MICH.—A reciprocating-type power saw designed for surgical work has a special tooth form and its cutting action is reversed from the conventional manner to produce a clean, rapid cut. The saw is intended primarily for cutting the sternum during chest surgery. In this work the retention of bone material and the inevitable clogging associated with conventional blades would be intolerable.

A reciprocating saw cutting on the upstroke would tend to pull the saw down into the work. Therefore, a downstroke cutting action was chosen. Also, depth of cut must be controlled closely because the material to be cut is of varying thickness. Overstroking the blade is not permitted, making depth control from the bottom mandatory.

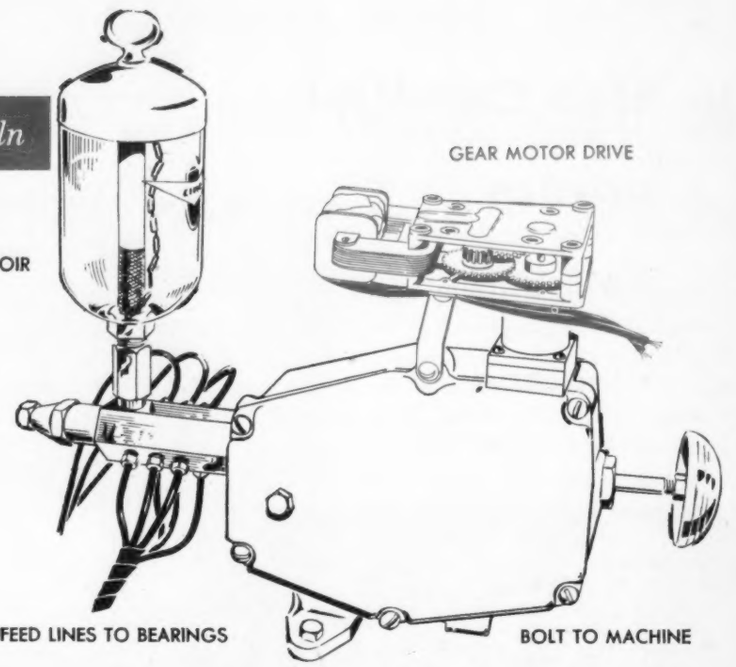
The saw produces a smooth, relatively bloodless cut. The sternum may be cut in either the vertical or transverse plane in less than 15 sec. It is effective in work on adult structures as well as on children.

The Sternal Saw is a development of Sarns, Inc.



CHIP-CONVEYING ACTION of saw forces chips away from cutting face through channels and up out of cut. Tooth form is identical on both sides of blade. Opening in bottom of foot prevents load-up under blade end. Downward cutting action keeps foot in contact with under side of cut. This separates tissue from cutting area as work progresses and controls depth of cut.

Design tips from Lincoln



Simple Gear Motor on Ratchet Multi-Luber® makes Automatic Electric Lubrication System

You can use a simple gear motor to drive Lincoln's new ratchet Multi-Luber to get a simple, low-cost electric lubrication system for light machinery of all types. Gear motor ratios of 1, 2, or 3 rpm and ratchet Multi-Luber ratios of 25:1, 50:1 and 100:1 let you choose the lubrication interval best suited for the machine.

The gear motor can be wired to any 110V/AC circuit so that the Multi-Luber provides lubrication whenever the machine is running. With standard setting, the Multi-Luber discharges 0.0025 ounces of lubricant (grease or oil) from each of the 12 outlet ports every time it cycles. Output of the first four ports can be doubled. The gear motor installs easily . . . you need only a clutch plate for the 3/16" output shaft and a mounting bracket.

You can use the gear motor if rotating or reciprocating motion is not available to drive the ratchet arm or if remote location of the lube unit is desirable to protect it during steam or caustic cleaning.

Multi-Luber units on cottage cheese packaging machines are giving these advantages according to the manufacturer: protect bearings against water contamination during steam cleaning, eliminate product contamination by lubricant, eliminate removal of protective side panels to manually lubricate, provide constant film lubrication on bearings. They have also extended the manufacturer's field service check from 90 to 120 days.

Note to Manufacturers:
Lincoln assists manufacturers in adapting automatic lubrication system to machinery . . . contact Lincoln's Original Equipment Sales Division.

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Bob Candlish

(B.S.—M.E., University of Michigan)

covers

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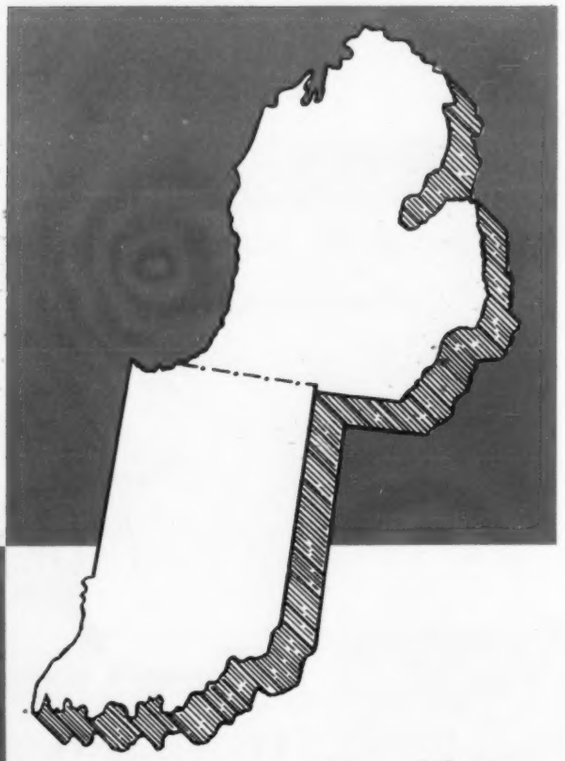
  and
- Indiana



for Design News

Robert Candlish, Detroit Editor, obtains technical details for a feature article using his portable recorder. With the designer listening to check accuracy, this is one of the time-saving devices used by DESIGN NEWS Regional Editors in bringing you accurate field reports.

Bob insists on getting information for his articles first-hand . . . all Design News Regional Editors do!

Bob is always on the move in search of new Design Ideas. It's his job to find them, to select pertinent facts, drawings and background material . . . then to report them accurately and concisely to you, the Design Reader.

Of course, many of his leads come by phone or letter from men like yourself. These he follows up in person.

Do you have an interesting Design Idea now past the preliminary design stage? If so, contact **Robert L. Candlish, Detroit Editor, Design News, 19600 W. McNichols Rd., Detroit 19, Mich., KEnwood 7-3740.**
He'll be glad to discuss a possible article with you.

Candlish inspecting cab-lifting mechanism on a GMC Tilt-cab truck in preparation for an article.

SEEN AND HEARD

STAGNANT PROGRESS

Robert L. Candlish, Detroit Editor

An auto trade journal (Automotive Industries, Dec. 15, 1960) has taken issue with DESIGN NEWS' comments on auto safety. This journal quotes freely from trade press releases and an SAE paper on "The Safety the Motorist Gets". Among the devices the journal credits to the generosity of the industry are four-wheel brakes, safety-glass windshields, turn signals and windshield washers.

Four-wheel brakes were adopted in the mid-twenties and safety glass was required by law in the early thirties. Turn signals also became standard fittings when required by law in many states. Where are examples of more recent progress in safety devices?

It is regularly pointed to with pride that, over the last 25 years, traffic deaths have decreased while the number of people and cars has increased. This improvement is almost wholly credited to the auto industry and very little credit is given to improved highways, traffic controls and law enforcement. Today's still very high traffic toll is considered to be almost wholly the fault of irresponsible drivers and owners who do not maintain their vehicles. The auto industry assumes no responsibility for deficiencies in design.

The automotive industry's interpretation of this is that design in regard to safety has gone as far as it needs to go. Actually, the high point in design safety was reached some time ago. When considering standard car models there was without doubt as much safety in the car of 25 years ago as there is in those built today.

Consider the car of 25 years ago. The brake drum area per 1000 lb of vehicle weight was quite comparable with the effective drum area offered on today's cars. Sixteen-inch wheels were common, and the brake drums were well exposed to the flow of cooling air. The difference is, however, that vehicle speeds were considerably lower than those possible today.

Older cars were fitted with running boards. These formed a strong protective member against side impact. The vehicle was also narrower and the narrower roof had a substantial crown which contributed considerably to strength for protection in roll-over accidents.

In contrast, the roof of today's car is very wide and quite flat. It is made of metal with maximum thickness of 0.035 inch. The new roof is supported largely by glass, not by steel. The roll-over accident

protection afforded is not of much consequence. It is conceded it is able to support a good, heavy snow load.

Bumper protection is another item that has not progressed with time. This is important since front-to-rear collision is the most common form of accident.

Judging from current designs, there is an apparent lack of appreciation by designers that the cars will ever be used in traffic. Bumpers, in many cases now only a gesture, were once rather substantial items. Heat-treated silicon-alloy spring steel was the common material used, not merely thicker body metal, as is the case today.

The bumper plus its vertical protective members also protruded beyond the farthest extremities of the car proper and were not hidden under a sheet-metal bustle. When a compact-model car of 1961 manufacture was driven against the rear of its standard-sized cousin, sheet metal touched first, with bumper-to-bumper contact still more than three inches away. This, with cars from the same factory! A retre· from reality is poor design.

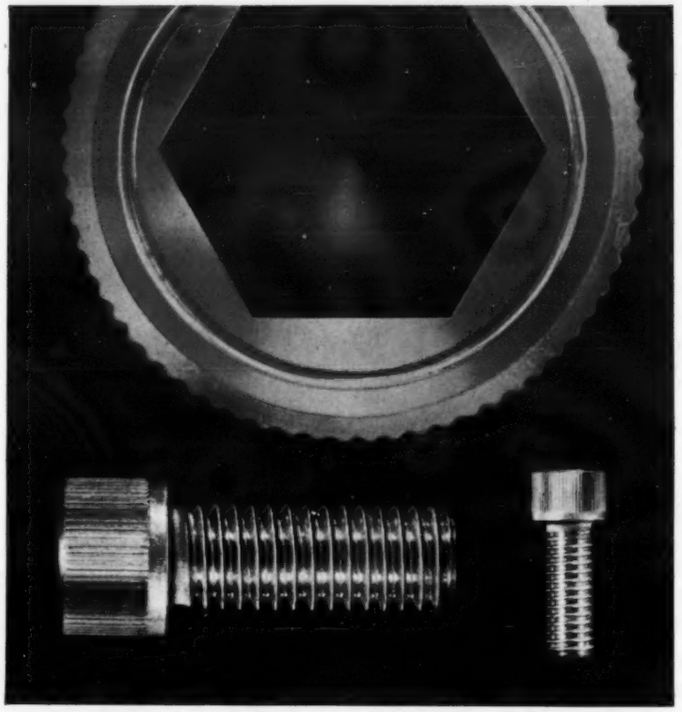
The doors of older cars probably had a greater tendency to stay shut in accidents because the latches were better adjusted in manufacture. Also, the smaller bodies were less flexible on impact than are today's balloon-type.

Power assistance provides easier but not necessarily better control of the car. This also applies to automatic transmissions. Windshield wipers of some recent cars have questionable efficiency. All in all, you were at least as safe in the old standard model as you are in the equivalent model today.

We were pleased to note that a friend of ours survived an accident last summer without his car doors coming open. We could introduce him to other people not so fortunate. He could, for example, look up a national TV network master of ceremonies who for years touted a premium make of car. Ask him if the doors of that car stayed shut in the serious accident he had in 1956. Our friend could also be shown the grave of a man killed when thrown out of his car in an accident in which the car damage was less than $100.

Or, we could introduce our friend to one of two young men knocked out of a car in an accident here in January. This man left the car by the left-hand door. He should be able to receive visitors by about April. The young man knocked out of the right-hand door is dead.

New UNBRAKO stainless socket screws offer 125,000 psi minimum tensile—certified!



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UNBRAKO KS 812 Stainless Socket Head Cap Screws

Test Temp.	−60°F	Room	800°F
Ultimate tensile strength, psi	147,000	131,870	101,400
Yield strength, psi	94,000	80,700	70,900
Shear strength, psi		85,000	
Fatigue endurance, psi		40,000	
Stress relaxation Initial stress 65,000 psi Residual stress after 50 hr			55,000
Magnetic permeability		below 1.05	

Besides high tensile strength, KS 812 offers good shear and endurance properties, adding to overall reliability of your stainless assemblies. New fastener meets or exceeds AMS 7472, FF-S-86.

If you are looking for more fastening strength in your stainless designs (without going to specials) . . . or for ways to reduce size or number of fasteners . . . the new UNBRAKO KS 812 provides an answer. Here at last is a stainless steel socket head cap screw offering a guaranteed tensile strength of 125,000 psi minimum. Yet this precision-forged, burr-free fastener is a standard, available in quantity off the shelf.

To make a corrosion-resistant cap screw that can be certified for 125,000 psi tensile, SPS uses a high-grade austenitic stainless, hardening it through cold working. Heads and sockets are forged; threads are rolled to preserve integrity of grain structure and enhance overall mechanical properties. Also the KS 812 has both the UNBRAKO pHd* head, which gives greater holding power, and the SPS Hi-Life thread root form, which increases fatigue resistance.

UNBRAKO KS 812 socket screws offer high corrosion resistance over a wide range of applications, as well as low magnetic permeability (under 1.2). Serviceable from —300° to 800°F, they come in sizes #8 through ⅜ in., fine or coarse thread. Ask your UNBRAKO distributor for more details or write Standard Pressed Steel Co. for new Bulletin 2734. INDUSTRIAL FASTENER Division, SPS, JENKINTOWN 6, PENNSYLVANIA.

*proper Head design (1960 series—standard on all UNBRAKO socket head cap screws, as is Hi-Life thread)

SPS

where reliability replaces probability

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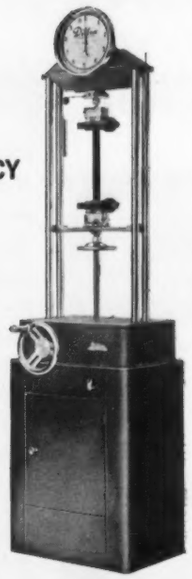

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DESIGN NEWS
DESIGN IDEAS

MECHANICAL

Optical Flat in Bore Pilotor

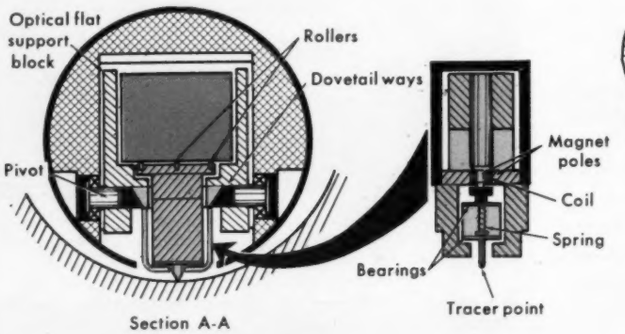
Robert L. Candlish, Detroit Editor

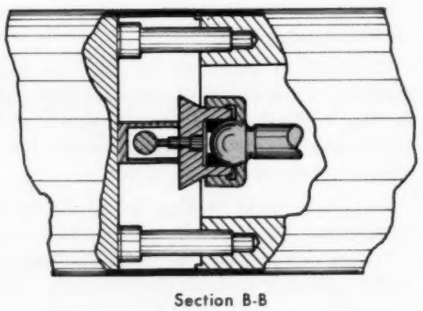
An optical flat is incorporated in a self-contained surface-inspection tool as a reference standard for a true surface. This permits the instrument to measure trueness of the bore surface in an axial direction as well as bore-surface finish. As well as incorporating an adjusting system for the optical flat, the tool also contains its own probe axial-traverse drive system and motor. Support pads and clamps are also built in, so the tool is self-supported.

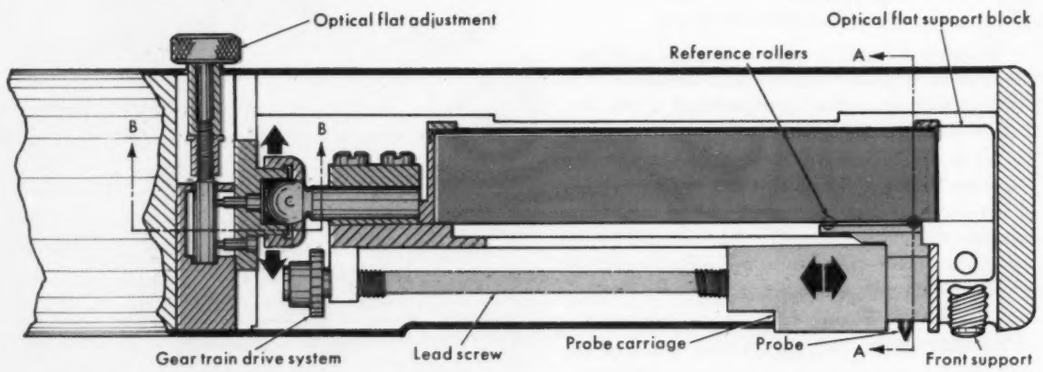
In operation the "pilotor" is positioned in the bore over the surface to be inspected with the probe in proper contact with the surface. The optical flat is adjusted to the proper position relative to the bore surface.

The inspection probe is then motor driven axially along the bore surface. The probe is also in contact with the reference optical flat. Variation in distance between the surface of the bore and the optical flat is a measurement of bore waviness. Minute variation in the surface is in the evaluation of the surface roughness. A discriminator in the electronic amplifier system permits measurement of either the bore surface roughness or waviness in the axial contour, or evaluates both conditions simultaneously. The readings of the instrument are commonly recorded on a strip chart, travel of the chart being electrically synchronized with the movement of the probe so the recorded defects may be positively located.

The Linear Pilotor Bore Inspection Tool is a development of Micrometrical Mfg. Co., Ann Arbor, Mich.

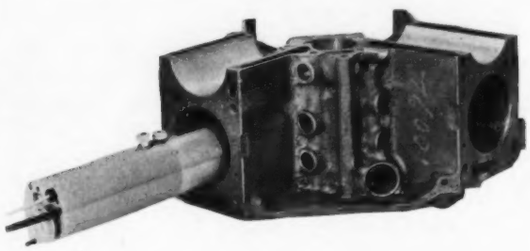




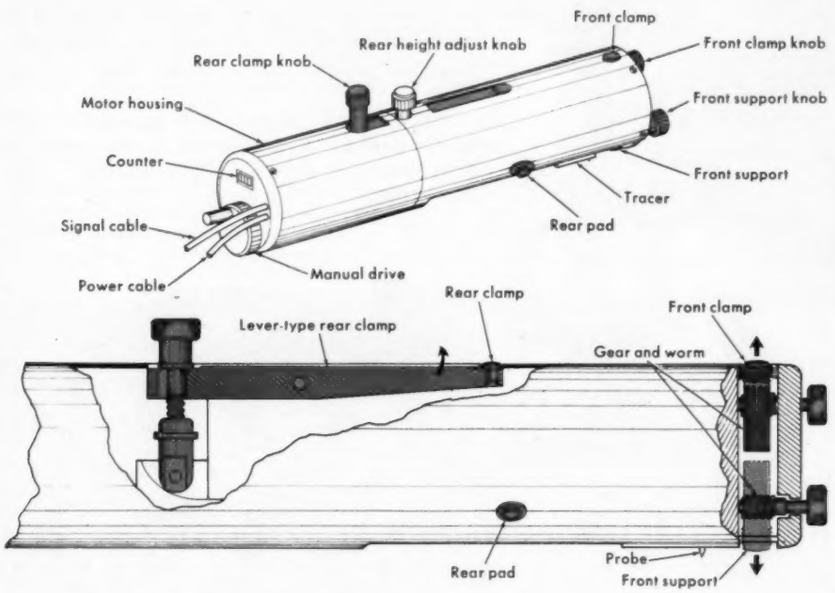


OPTICAL FLAT is brought into proper reference with bore by adjustment of ball socket. Motor-driven lead screws move probe carrier axially in dovetail ways. As tracer moves along work surface, movement of probe with respect to optical flat displaces core, changing transformer coupling and providing a voltage proportional to probe displacement. Probe tip is cone-shaped with 0.0005-inch spherical radius, permitting entry into minute surface irregularities.

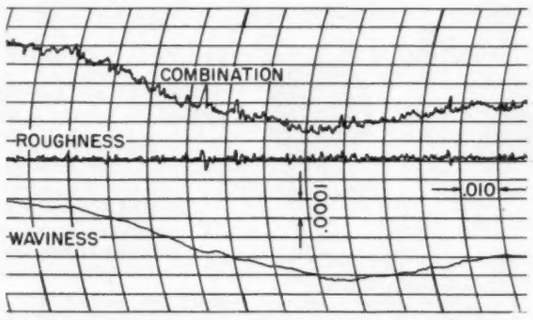
Evaluates Contour and Finish



PILOTOR INSPECTS BORES having access from both ends, of 3- to 4.5-inch dia and with minimum length of 4.5 inches. Maximum length of stroke is 4 inches. Tracing speed is 0.30 ipm. Counter on control end indicates position of probe in inches from end of stroke.



PILOTOR rests in bore on rear pad and adjustable front support. Control knobs operate pads and clamps. Front support height is varied so probe contacts surface properly at front end of stroke.



BORE SURFACE PROFILE or waviness profile or combination of both may be recorded on chart. This differs from rms or Arithmetic Average measurement of surface roughness as is shown by "Profilometer" recording.

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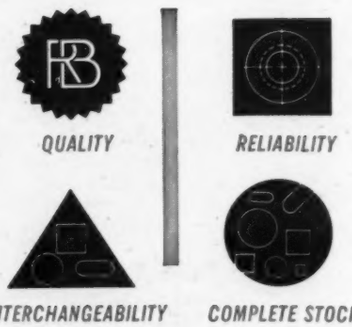

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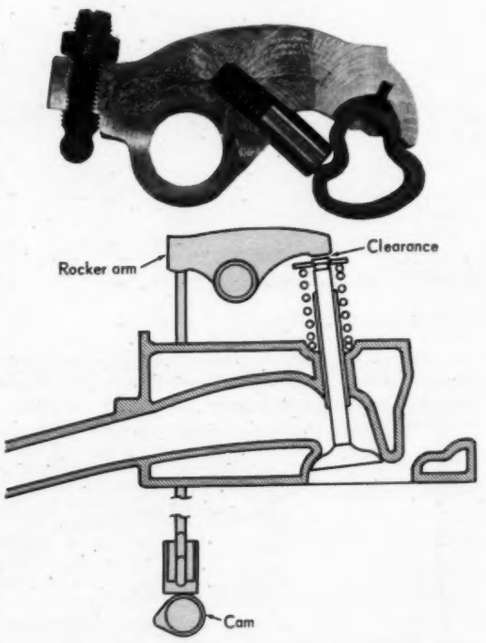
Rocking-Wedge Maintains

Robert L. Candlish, Detroit Editor

A spring-loaded wedge-type cam eliminates clearance in the valve train of an internal-combustion engine. This quiets the noise always associated with excessive clearance in overhead valve engines. The rocker-arm cam also prevents a valve from being held open due to thermal expansion of the valve train.

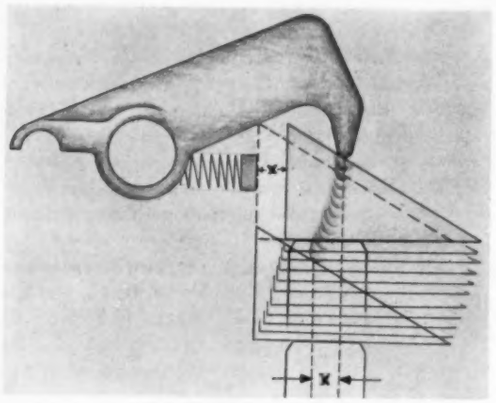
The rocker-arm assembly will compensate for approximately 0.060-inch clearance variation. Automatic adjustment is obtained by positioning an indentation on the wedge cam directly over the center-line of the valve stem and establishing valve-train clearance at zero. Feeler gages are not required.

The automatic clearance-adjusting device is a development of the Engine Engineering Dept. of Ford Motor Co., Engine and Foundry Div., Dearborn, Mich.



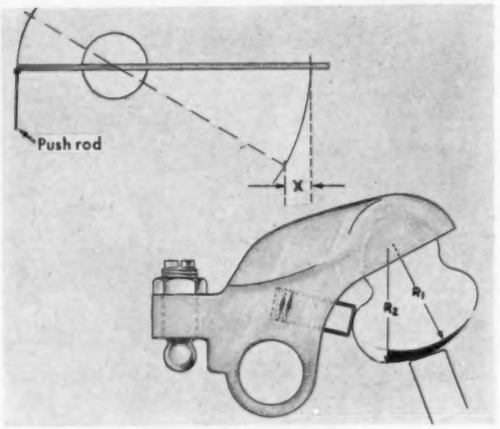
ROCKER ARM is permanent mold, aluminum casting. Wedge cam is sintered iron. Spring in rocker-arm pocket causes momentary separation under unloaded condition before wedge cam eliminates clearance after valve closing. Dash mark in lower face of cam is reference for initial adjustment of system.

Zero Clearance in Engine Valve Train

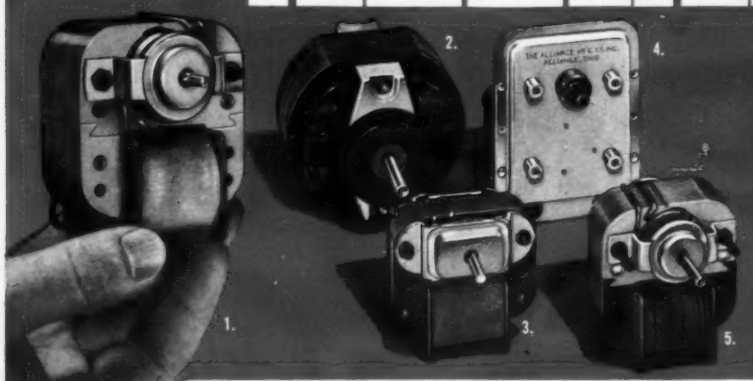


SPRING-ACTIVATED WEDGE SECTION maintains zero valve-train clearance. Rocker opens valve because slide resistance at rocker tip (friction plus incline) is greater than at stem end (friction only). Rocker contact with wedge is fixed point of rotation and wedge slides across valve tip as rocker would in conventional installation.

WEDGE is formed on circular cam. Cam rolls in rocker-arm pocket and rolls as well as slides on valve tip, depending on portion of cycle. After valve closes, cam moves across valve end under spring activation as does wedge to take up any clearance in system.



Choose from ALLIANCE



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L	117	6.5	1.2	77	3250	4 Lbs.
H	117	1.0	.31	17	2500	1 Lb. 6 Oz.
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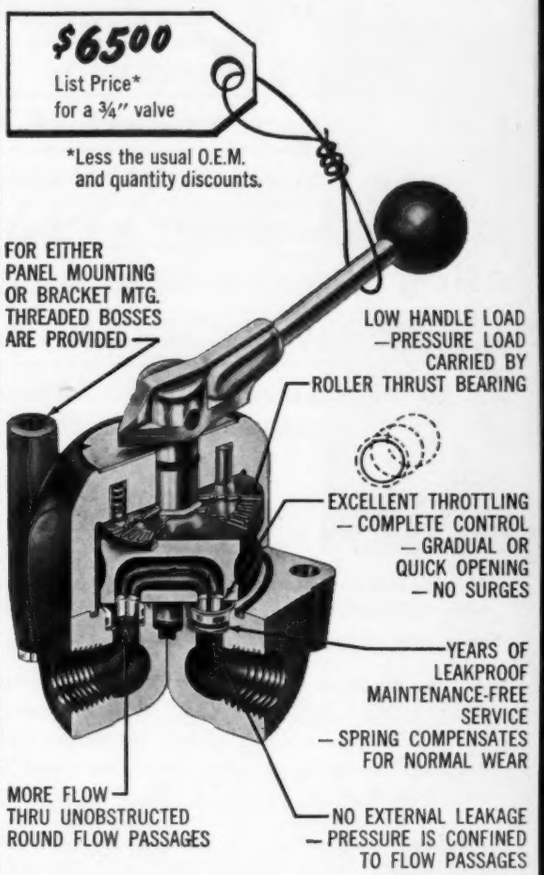
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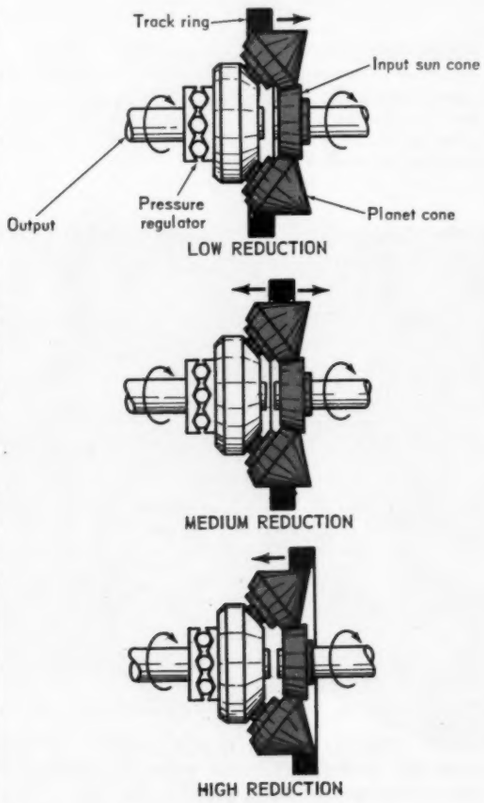
Planetary Cones Form

Toyotaro Yamada, Correspondent in Japan

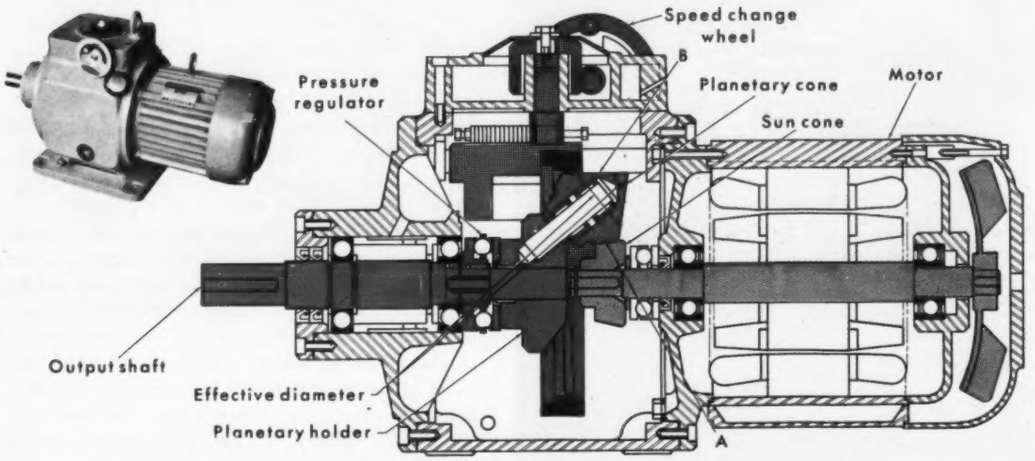
Several metal cones are planets in a continuously variable reduction unit resembling an epicyclic-gear transmission, but containing no gears. Friction between smooth surfaces of metal sun cone, planet cones and annulus suffices for transmission of up to two hp. Smooth, silent and vibration-free operation is said to result with an efficiency of about 94 percent.

The unit was designed by Manabu Kashiwabara of Shinpo Kogyo Co., Ltd., Kyoto, Japan, and has a reduction ratio variable from 4:1 to 24:1.



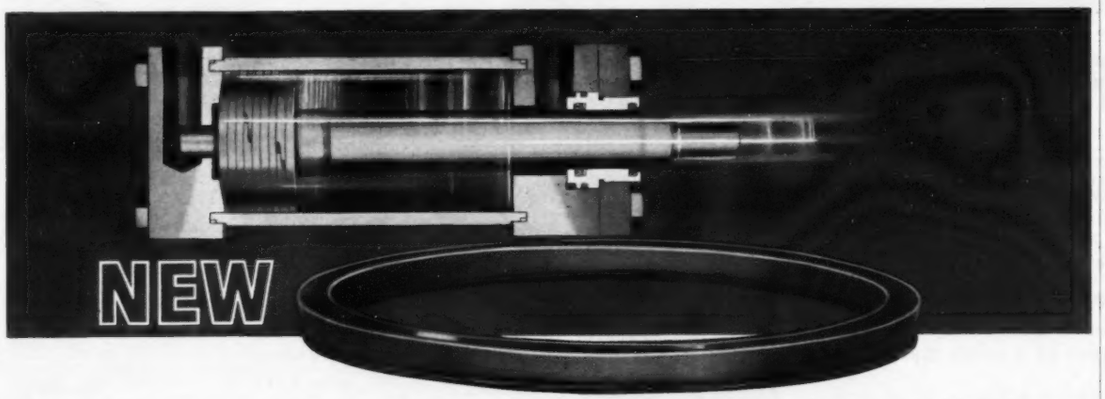
THREE POSITIONS of non-rotating annulus show operation. Minimum reduction is obtained when annulus is at maximum planet radius, while minimum output speed results when it is at cone tips. Ball-loaded cam arrangement in output shaft adjusts contact pressures automatically for best performance. Ring is said to be sufficiently flexible to accommodate slight misalignment of cones.

Continuously Variable Transmission



REDUCTION forms single unit with drive motor. Sun cone on motor shaft runs on rear bevel tracks of planet cones, which turn freely on axes fixed in hub on output shaft. Stationary annulus presses on main bevel face of cones, forcing them to rotate output shaft when sun gear is turned. Axial adjustment of annulus varies speed.

DURATON ROD SEAL IN HYDRO-LINE CYLINDERS



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Direct-Balancing

E. J. Stefanides, Central States Editor

A line of high-speed natural gas compressors uses a horizontal balanced-opposed cylinder arrangement to allow direct balancing of the reciprocating masses by varying crosshead weight. This allows two basic 6-inch-stroke compressor designs to be used with a variety of cylinders from $2\frac{5}{8}$ to $22\frac{1}{2}$ inches in dia.

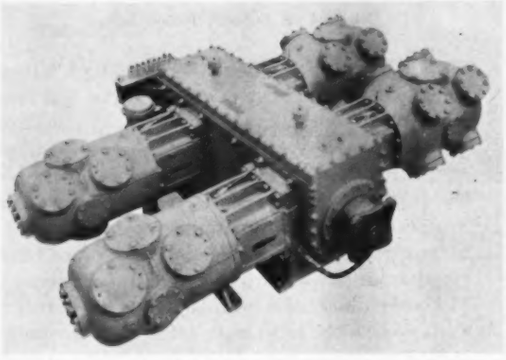
Balancing of the various piston combinations is accomplished by varying the weight of the crosshead components. Three different-weight crossheads and five different-weight crosshead nuts permit balancing of all required piston combinations to within $2\frac{1}{2}$ lb. In addition, because of the short distance between throw centerlines, the couple unbalance is kept to a low magnitude. To simplify maintenance, the crossheads are of a type that can be used with solid crosshead guides and can be removed through an opening in the side. They employ an unusual thin-shell OD bearing, segment-type, shoe design. These shoes are steel with the bearing material on the outside and are smaller in ID than the crosshead surface. As a result, when pulled down by countersunk cap screws, they spring into place, assuring good alignment and concentricity.

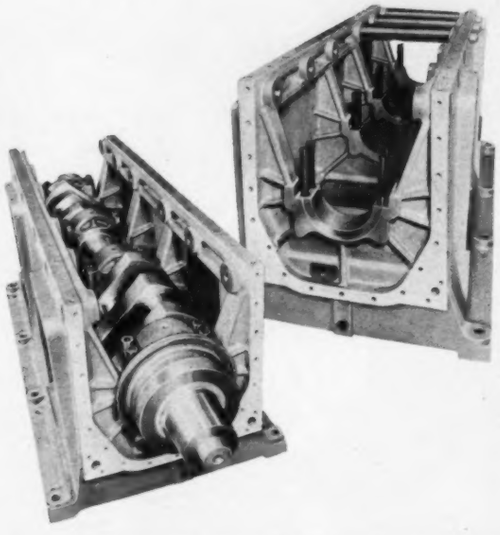
Other features for easy maintainability are the use of an open-top crankcase and split main bearings which permit complete removal of the crankshaft without removing the machine from its base mounting. To maintain crankcase rigidity, large-diameter, solid spacer bars are fitted across the top of the crankcase. They are held in place by cap screws.

This line of compressors is used to compress gas at the well-head for transfer to the gas gathering station. They are multistage, double-acting machines and are designed to run at speeds from 600 to 900 rpm. They are designed and manufactured by the White Diesel Engine Div. of the White Motor Co., Springfield, Ohio.

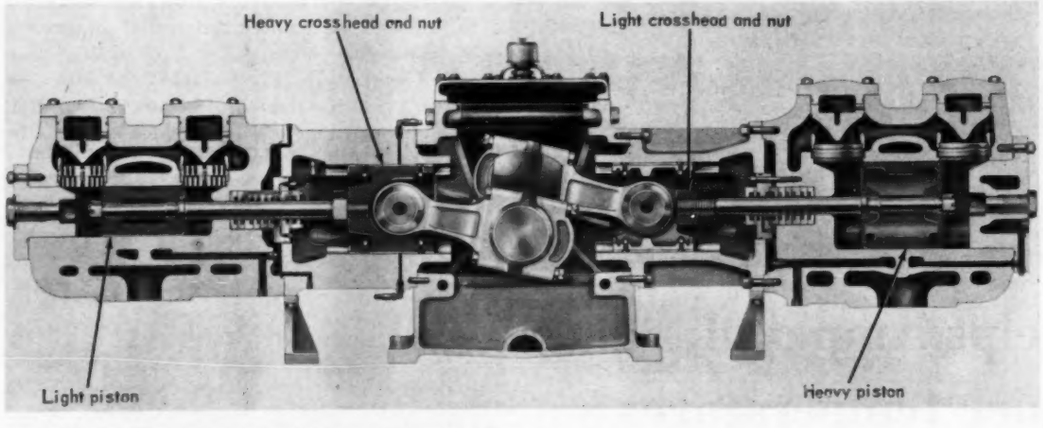
CROSSHEAD BEARING oil groove is coin-pressed into shoe and has long radius edge to maintain oil film. Crossheads can be removed from solid guides by rotating and lifting. Wrist pin is taper fit in sides of crosshead. Through-bolt, which holds pin in place, also is used to pull pin from taper.

Compressor Design Allows Variety of Cylinder Sizes

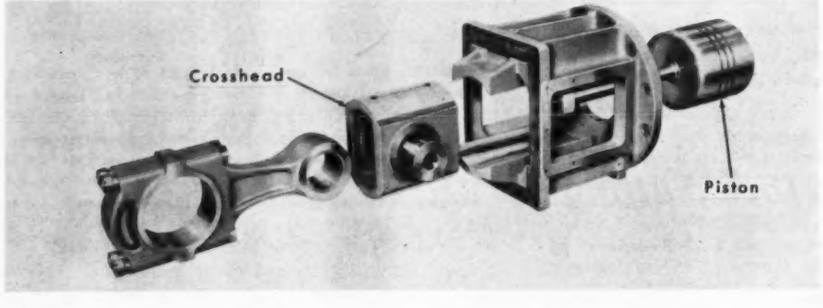




CRANKSHAFT REMOVAL is accomplished without removing machine from base. Removal of spacer bars and split main bearing allow crankshaft to be lifted out through top.



TYPICAL SECTION THROUGH COMPRESSOR shows how inertia force balance is achieved by combining lightweight pistons with heavy crosshead components and heavier pistons with lighter components.

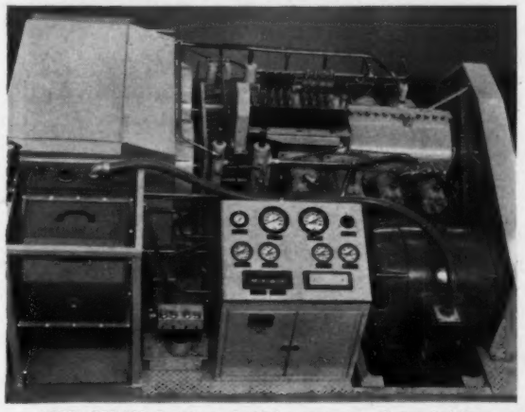


When You Need

HIGH PRESSURE
HIGH CAPACITY, HIGH PURITY

AIR, HELIUM NITROGEN

FOR COMPONENTS TESTING OR PRODUCTION



MODEL DPB-CCS Four-stage, 8-cylinder compressor. System includes full dehydration and oil removal, filter and complete control panel. Backed by Cardair's 20 years of high pressure gas experience. The only ICBM type compressor qualified by 2500 hour life test.

CCC CARDAIR CENTRAL COMPRESSION SYSTEMS

Guarantee Delivery

- up to 12,000 psi continuous
- with less than 1 ppm oil content
- 150 SCFM @ 128 psig intake • dewpoint −100°F.

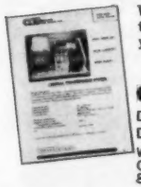
Developed and qualified as GSE equipment for ICBM program—now available from stock or programmed production!

Most recent broad purpose Central Compression System in the Cardair line, the Model DPB-CCS is a semi-portable, skid mounted unit, ready to install on location in less than a day. Only electrical and high and low pressure connections are needed.

In addition to air, helium and nitrogen, it can be easily adapted to other gases including hydrocarbons and hydrogen. Pressure range is from 3500 to 12,000 psi in continuous service and to 15,000 psi intermittently. Complete dehydration and oil removal equipment are included.

For either testing or production, it may also be used as a central high pressure source for diverse locations, with Cardair supplying the complete system.

Maintenance is simple and minimal, with nationwide Cardair service facilities. Installation is easy—no heavy concrete base is required.



Write today for illustration sheet and technical data—or send us information on your particular high pressure supply needs.

CARDAIR
DIVISION OF MARMON-HERRINGTON COMPANY, INC.
Dept. 18, Box 147—Lebanon, Indiana
Western States Distributor:
General Air Equipment
824 Hollywood Way, Burbank, Cal.

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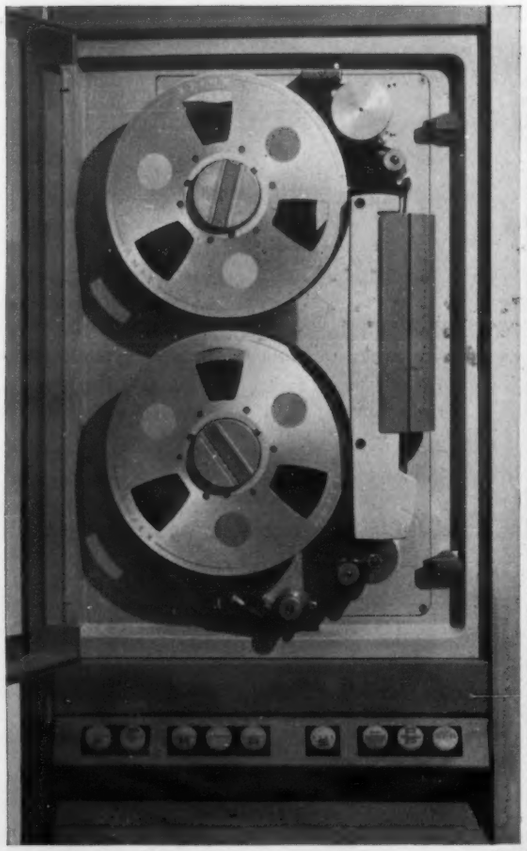
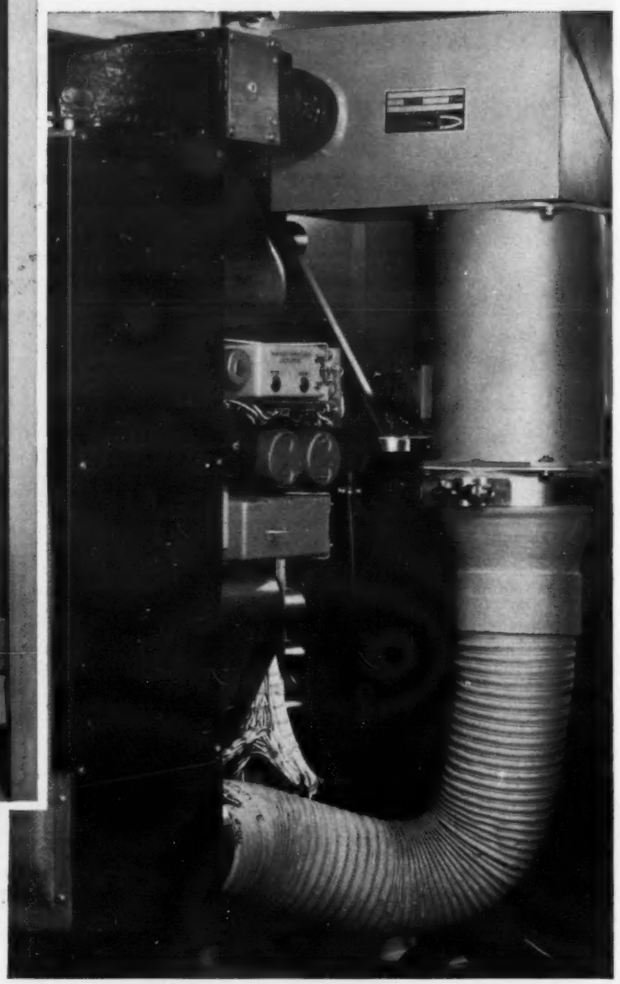




New Ampex FR-700 Tape Recorder, with tape transport closed (above), and opened (right). Flexible Tubing swings with the tape transport to provide constant ventilation.

How Flexible Tubing helps Ampex designers control tape recorder temperatures

In designing the new Ampex FR-700 Recorder, a big problem was how to keep internal temperatures between 40°C and 60°C. What's more, there was only limited space available for ventilation ducts!

Chosen by Ampex designers to handle this tough temperature-control job: a rugged nonmetallic duct with a wire helix — Flexible Tubing's "Flexflyte."

"Flexflyte" allows Ampex designers to carry cooling air anywhere there's available space. It's lightweight, easy to install, long-wearing. Offers great design flexibility!

If you work on any kind of original equipment where the handling of air, liquids or light solids is a design problem, there's a Flexible Tubing product for the job. You can choose coverings, coatings and sizes to fit your specifications.

Flexible Tubing is at work today on diesel engines, farm combines, vacuum cleaners and hundreds of other places. To find out how Flexible Tubing can help you, consult your Flexible Tubing regional sales engineer.

Flexible Tubing
CORPORATION
203 New Whitfield St., Guilford, Conn.
Anaheim (Los Angeles) • Hillside (Chicago)

Circle 18 on Reader-Service Card for more information

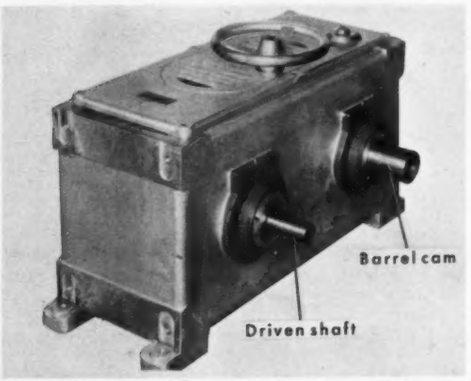
Wedges and Barrel Cam

Celestino O. Lubatti, Italian Editor

Two radial wedges with mating bevel faces follow inner contours of a barrel cam to adjust belt tension between variable-pitch sheaves. The wedges control the rate at which sheave flanges separate or approach each other as the speed ratio is changed through a handwheel and worm-drive mechanism. This differential drive-sheave adjustment permits a wide range of output ratios from speed-down to speed-up with constant tension.

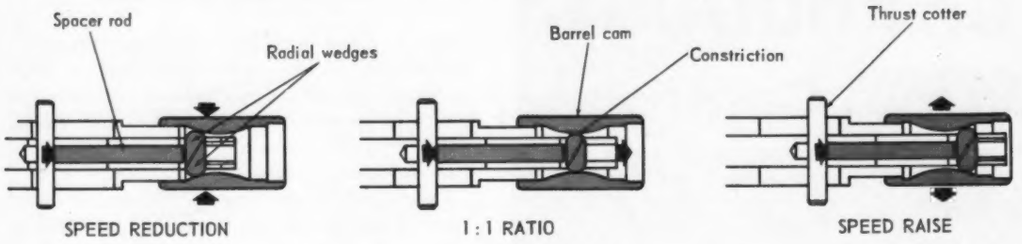
Toothed ends of a worm-operated adjustment shaft constantly mesh with teeth on ratio bushings. The wedges vary the axial distance between a spacer rod and the end screw of a slide shaft controlling flange separation of the sheaves. This axial distance is inversely proportional to wedge expansion. Because of the constriction in the barrel cam, expansion is minimum when the sheaves are set for 1:1 speed ratio and maximum for lowest or highest output speed.

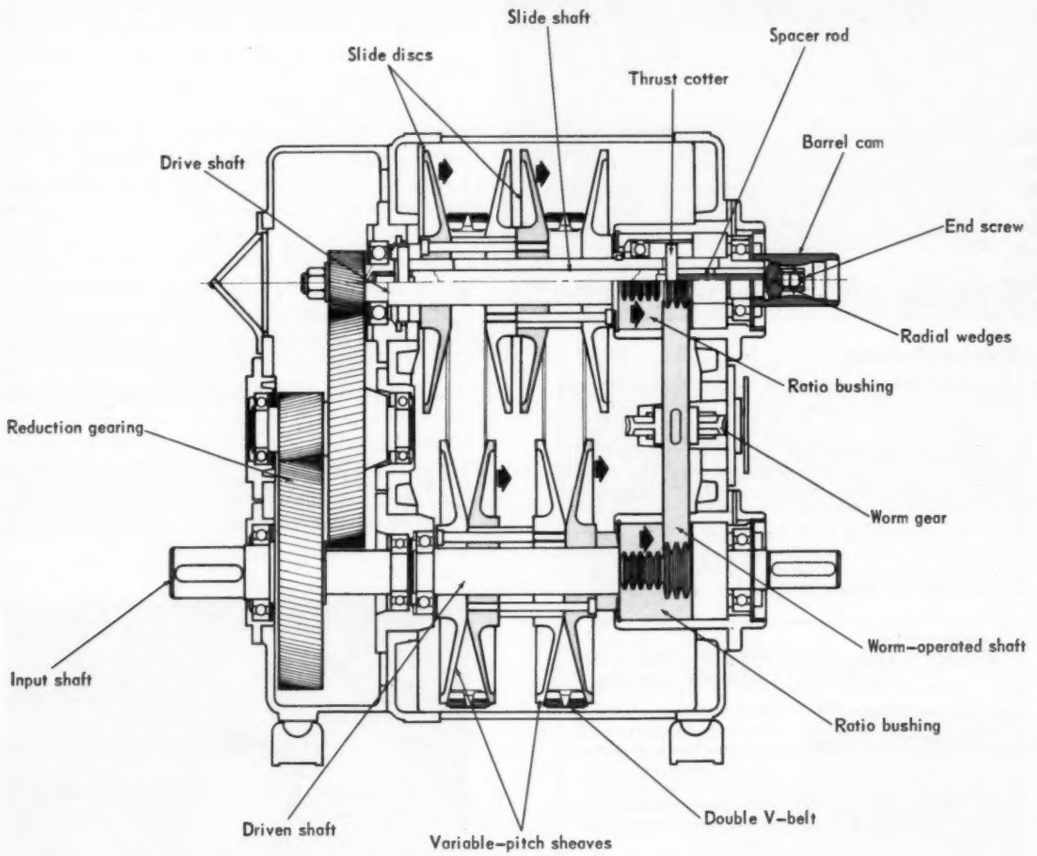
The barrel cam shape is accurately calculated to produce the required differential adjustment of the drive sheave according to variations of theoretical belt length. The variable-speed drive was developed by Costruzioni Meccaniche Ing. dipl. G. C. Borgna, Pinerolo, Italy, and is marketed by VIBI SpA, Milan, Italy.



BARREL CAM for automatic control of belt tension is screwed on drive shaft of variable-speed drive. Handwheel varies speed ratio. Maximum speed developed by standard unit is five times higher than minimum output speed. Since both driving and driven sheaves are variable, speed ratio equals square root of speed range. If constant-speed input is, for instance, 870 rpm, minimum output speed is $\frac{870}{\sqrt{5}} = 390$ rpm; maximum speed is $870\sqrt{5} = 1950$ rpm. Models are produced for 0.5 to 50 hp.

Adjust Belt Tension for Various Speed Ratios





TWO VARIABLE-PITCH SHEAVES for each shaft, double V-belts permit high power rates. Reduction gear is coupled to variable-speed transmission for low input speed. Ratio bushings meshing with worm-operated shaft displace interconnected slide discs to vary V-groove opening. Slide discs on driven shaft are constantly kept against ratio bushing by belt tension. Hollow drive-shaft houses slide shaft and belt-tension control. Thrust cotter, axially positioned by ratio bushing, drives spacer rod against radial wedges to move slide shaft and discs. Barrel cam causes radial retraction of wedges and gradual increase of axial distance between end screw and slide shaft as slide shaft is moved to right. As 1:1 speed ratio is exceeded, divergent shape of barrel cam allows wedge expansion to retard sheave narrowing and prevent excessive belt tension. End screw permits loosening wedges for V-belt removal or replacement.

SOUTHWEST

"Monoball"®

SELF-ALIGNING BEARINGS

ROD END TYPES

PATENTED U.S.A.
All World Rights Reserved

PLAIN TYPES

CHARACTERISTICS

	ANALYSIS	RECOMMENDED USE
1	Stainless Steel Ball and Race	For types operating under high temperature (800-1200 degrees F.).
2	Chrome Alloy Steel Ball and Race	For types operating under high radial ultimate loads (3000-893,000 lbs.).
3	Bronze Race and Chrome Steel Ball	For types operating under normal loads with minimum friction requirements.
4	"Dyflon"® Plastic Alloy Inserts. CRES Ball and Race. Chrome Alloy Steels.	For types operating under rotational, high radial loads and long cycle life where lubrication is impossible.

Thousands in use. Backed by years of service life. Wide variety of Plain Types in bore sizes 3/16" to 6" Dia. Our engineers welcome an opportunity of studying individual requirements and prescribing a type or types which will serve under your demanding conditions. Southwest can design special types to fit individual specifications. Write for Engineering Manual No. 551. Address Dept. DN-61

SOUTHWEST PRODUCTS CO.
1705 SO. MOUNTAIN AVE., MONROVIA, CALIFORNIA

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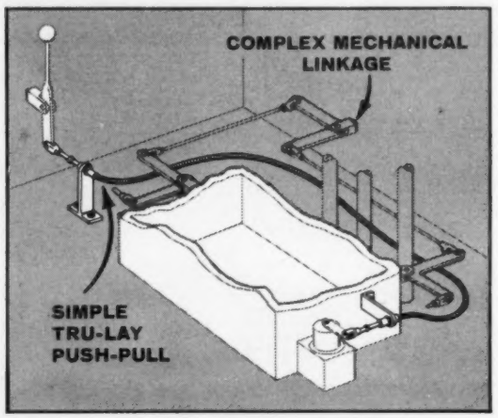
ACCURATE REMOTE CONTROL FOR HUNDREDS OF PRODUCTS

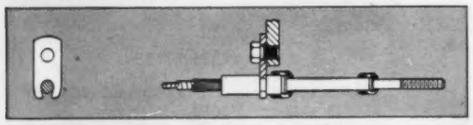
— —with Tru-Lay *PUSH*-PULL Controls

If your products involve remote control—electrical, hydraulic, pneumatic or direct—TRU-LAY PUSH-PULL FLEXIBLE CONTROLS can help solve your design problems. They provide positive remote control over short or long distances—up to 150 feet from the control point. Because they operate while flexing, they can snake around obstructions. They will not buckle. They are ruggedly constructed, easily installed and operated, sealed against dirt and moisture, and will handle jobs with as much as 1,000 lbs. input. PUSH-PULL CONTROLS are simple, have but one moving part, are noiseless and give a lifetime of accuracy. Mechanical linkages, on the other hand, are complex. Unlike PUSH-PULL CONTROLS, they are made of many parts, wear at many points, and produce increased backlash, vibration rattles and lost accuracy.

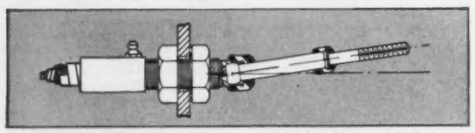


THESE FEATURES HELP SOLVE DESIGN PROBLEMS

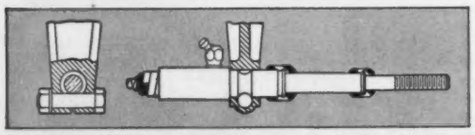
Anchorages



Clip anchorage • a simple clip for light loads

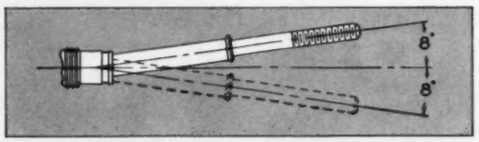


Bulkhead anchorage • for heavy-duty installations



Machined bracket anchorage • can be furnished for mounting any PUSH-PULL cable at the swivel terminal

Swivel Action



Standard assemblies have end fittings with a swivel movement of ± 8° to compensate for misalignment and rise or fall of lever arms. Swivel joints, and the sliding ends, are sealed against dirt and moisture.

***PUSH*-PULL DATA FILE SHOWS HOW TO SIMPLIFY, IMPROVE DESIGN**

• Write for your PUSH-PULL Data File. It contains a complete set of engineering bulletins which describe in detail the operation of PUSH-PULL CONTROLS, their applications, features and advantages.

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Circle 20 on Reader-Service Card for more information

Ring Spring Absorbs

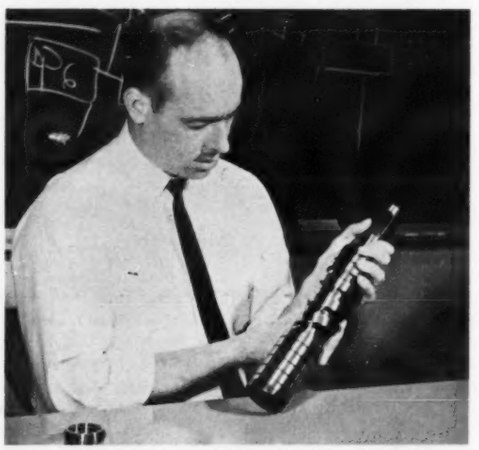
Victor W. Wigotsky, Eastern Editor

A ring spring is an efficient shock absorber which handles 24,000-lb forces in restricted space. High load capacity, limited motion and relatively low return of absorbed energy are provided. Device was developed for possible use in the tail hook of a carrier-based aircraft.

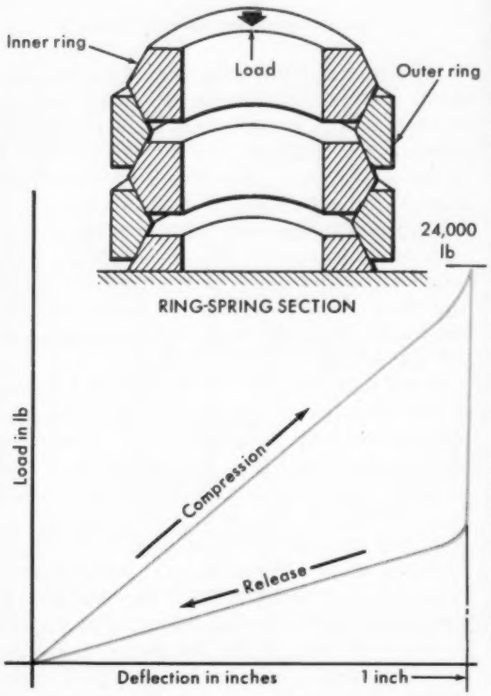
Design utilizes the ring spring's action under load similar to a simple bar in tension. This assures excellent energy storage capacity for a given weight of material. Under axial load, the rings slide relative to each other to compress the male and extend the female rings. Resulting uniform circumferential stresses in the rings produce the "bar in tension" effect and high load capacity.

Unit also uses friction as a "plus", both in compression and extension. Frictional force on the faces of the rings acts against the load as the spring is compressed. A higher load is necessary to produce spring motion than would be required in a spring without contacting elements. This "additive" effect of friction then permits greater shock absorbing capacity for given size. During load release, however, the opposing effect of friction results in a high rate of energy absorption and reduced recoil. Total motion of the spring, which consists of 22 conically faced rings, is one inch.

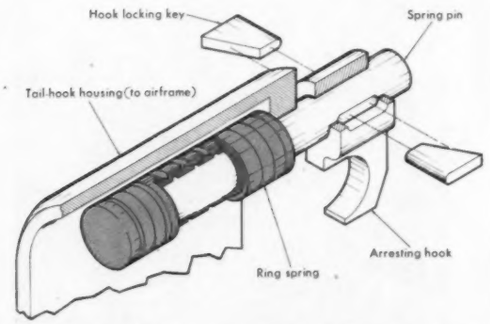
The arresting hook shock absorber was designed by the Machine Design Div., Anderson-Nichols & Co., Inc., Boston, Mass., under contract with Naval Air Engineering Facility, Philadelphia, Pa.



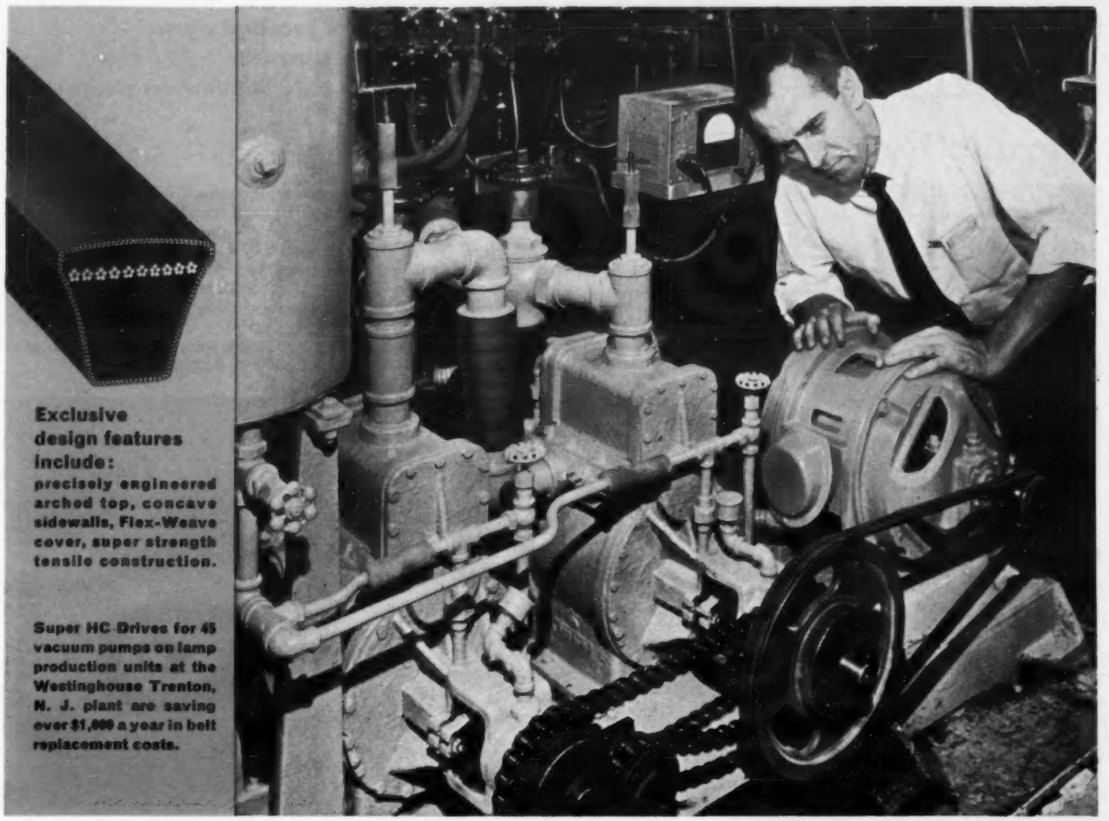
Jet's Arresting Hook Shock



LOAD DEFLECTION CURVE illustrates high rate of energy absorption during release, because of basic ring spring characteristic. Frictional forces on faces are additive during compression and subtractive as spring is released. Also, tension bar effect resulting from uniform circumferential stresses permits high load capacity in small space.



RING SPRING HAS 8-INCH FREE LENGTH and 7-inch compressed length under 24,000-lb force. Unit is designed to allow relative motion between aircraft and its arresting hook during carrier landings. Motion occurs when arresting hook contacts cable, thereby possibly reducing cable and hook point damage resulting from initial impact load.


Exclusive design features include:
precisely engineered arched top, concave sidewalls, Flex-Weave cover, super strength tensile construction.
Super HC Drives for 45 vacuum pumps on lamp production units at the Westinghouse Trenton, N. J. plant are saving over $1,000 a year in belt replacement costs.

Westinghouse converts drives on 45 machines to new Gates Super HC High Capacity V-Belts

When drive space is limited, a driver sheave too small in diameter is sometimes used—though not recommended. Constant flexing over a small sheave is severe punishment for V-belts. Because of this, conventional V-belts lasted 4 months or less on the vacuum pumps on lamp production units at the Westinghouse Lamp Division plant in Trenton, N.J.

Now, with space-saving Gates Super HC High Capacity V-Belt Drives on all 45 machines, all belts are still running strong after more than 1½ years . . . a saving of over $1,000 in belt replacement costs plus even greater savings through reduced down-time.

The Gates Super High Capacity V-Belt is a new concept in V-belt design.

It is industry's first and most advanced high capacity V-belt. Because of exclusive design features, Gates Super High Capacity V-Belts transmit up to 3 times more horsepower than conventional V-belts in the same space. Or the same power can be handled with fewer belts and smaller sheaves in less space.

As a result, Gates Super HC Drives save up to 50% in drive space . . . cut your drive costs as much as 20% . . . reduce drive weight 20% and more . . . and make possible further savings in material costs.

Your local Gates Field Engineer is an experienced, fully-qualified drive design expert. Contact him for Super HC design information and for design help.

Building the future on 50 years of progress

The Gates Rubber Company, Denver, Colorado 8P4D

Gates Super HC V-Belt Drives

Circle 21 on Reader-Service Card for more information

PRODUCT-DESIGN BRIEFS FROM DUREZ

- **Matte finish for molded parts**
- **Phenolic for blowers**
- **Fire-safe, bakable reinforced polyester**

NORTON LABORATORIES, INC.

Want less gloss?

For years we've trumpeted the virtues of the high gloss that's characteristic of phenolic molded parts.

Gloss, however, is not always a plus. In certain precision instruments, gloss translates into *glare*. Sometimes, too, a consumer product can gain esthetically from the satiny look and feel of a matte finish.

One custom molder, Norton Laboratories, Inc., has developed a special process for putting matte finishes on compression-molded phenolic parts, as on the double-duty lamp handle-switch above. In some instances, the finish takes the place of a painting operation and so lowers cost.

The plastic molder now supplying this type finish is Norton Laboratories, Lockport, N. Y. We suggest that you write to them directly for quotations on plastic parts you need incorporating this finish.

Move air at low cost

Note the economy of design in this blower and duct assembly for an automatic washer-dryer. Why use more pieces when three will do?

Note, too, how economy begets economy. Very few assembly operations. Few rejects, because these phenolic parts can't get bent and won't warp. No balancing needed in the blower wheel, because concentricity is molded in. Wobble is much less than could be achieved at low cost in a metal wheel.

Phenolic is functionally right for air-moving jobs, especially if they also involve heat: a small hair dryer, a big circulating fan, or just about anything between. Inexpensive general-purpose molding compound serves adequately, as a rule: withstands moisture and mild corrosive atmospheres; is unbothered by temperatures up to 300°F; even resists flame spread; operates for years without rattling, drumming.

Your molder of thermosetting plastics can probably help *you* achieve such economy, whether in a blower or some other part you're working on. To get more ideas on where and how to use phenolic molding compounds, send in the coupon, requesting Durez Bulletin D400.

The different polyester

Cutting across the currents and countercurrents of talk about reinforced polyester plastics are two incontrovertible facts:

1. You can get a polyester molding material that's *inherently and permanently self-extinguishing.*
2. This same polyester can take a baked-on finish without surface craze.

Its name is Hetron.® The self-extinguishing trait does not come about as a result of diluting the plastic's strength with additives. It's there to begin with, in atoms of chlorine welded tightly into the resin molecule. That's why it lasts.

So much for chemistry. The craze resistance takes longer to explain, but matched-die molders know they can count on it for structural shapes that must undergo a 90-minute bake at 350°F.

Superimpose these two truths on the other advantages of strong, lightweight polyester construction, and you can appreciate why Hetron is helping so many designers give shape to new ideas. This luggage pod for a jet airliner is one case in point. Others include 65-foot radomes, factory skylights, large boat hulls, outboard-motor shrouds, chemical ducts and vessels, transformer housings, heavy-duty switch-gear components.

If you'd like to know more about this versatile material, check the coupon for designer's Hetron data file.

For more information on Durez materials mentioned above, check here:

- ☐ Phenolic molding compounds (8-page Bulletin D400)
- ☐ "Durez Plastics News" (a review of current plastics applications, mailed bimonthly)
- ☐ Hetron polyester resin (data file and list of fabricators)

Check, clip and mail to us with your name, title and company address.
(When requesting samples, please use business letterhead)

DUREZ PLASTICS DIVISION

2103 WALCK ROAD, NORTH TONAWANDA, N. Y.

HOOKER CHEMICAL CORPORATION

HOOKER CHEMICALS PLASTICS

Circle 22 on Reader-Service Card for more information

IDEAS... MECHANICAL

Variable-Throw Crank,

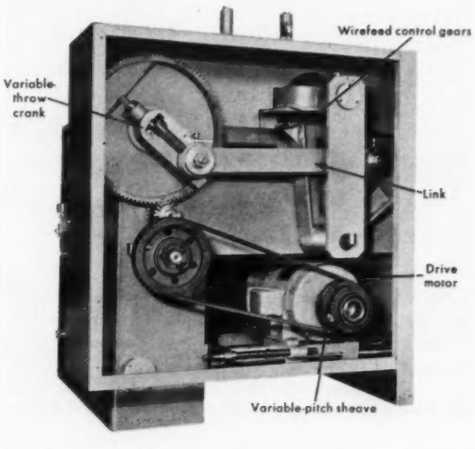
Lars G. Soderholm, Midwest Editor

A redesigned wire-bail forming machine automatically produces bails for handles found on cans or small pails. A variable-throw crank mechanism measures the length of wire for handles from 4 inches to 13⅝ inch in dia. A curling roll deflects the wire around a horn, where it is held and cut to length. Forming dies produce hooks at the ends of the handle in any desired shape. This automatic machine takes wire up to No. 6 gauge size from a coil, straightens it, bends and cuts the handle and forms hook ends at a rate up to 140 handles per minute.

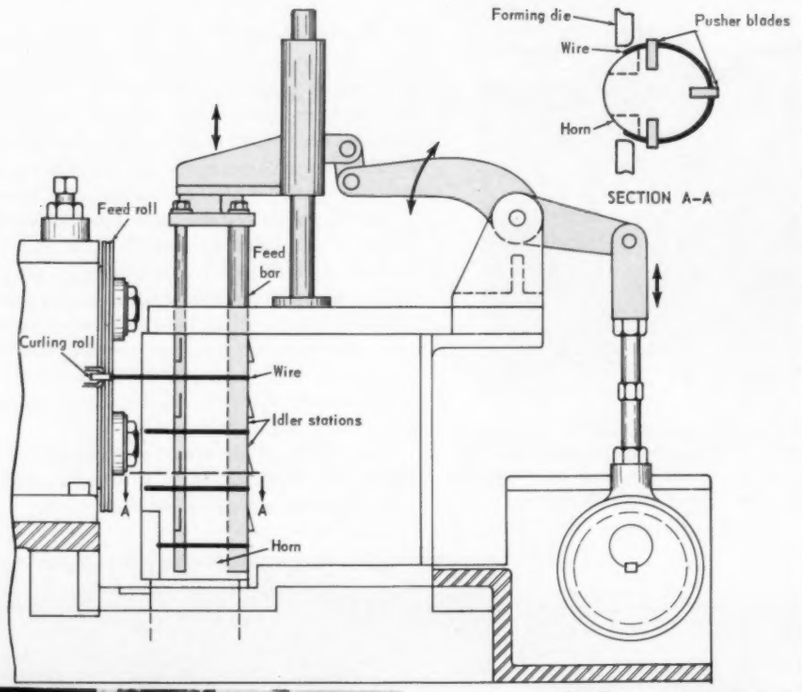
Power is supplied by a three-hp (five-hp optional) electrical motor driving through a variable-pitch motor sheave for infinite speed adjustments through its range. The wire passes from the straightening rolls into the drive rolls, after which it is deflected by the curling roll. The curling roll gives the wire its initial bend so it can be collected about a hardened steel horn. A cam-operated cut-off knife slices off the bent wire. It then passes down through several idler stations on the steel horn. At the last station, cam-operated forming dies move in to form a hook at the ends of the handle. The handle is then discharged from the machine.

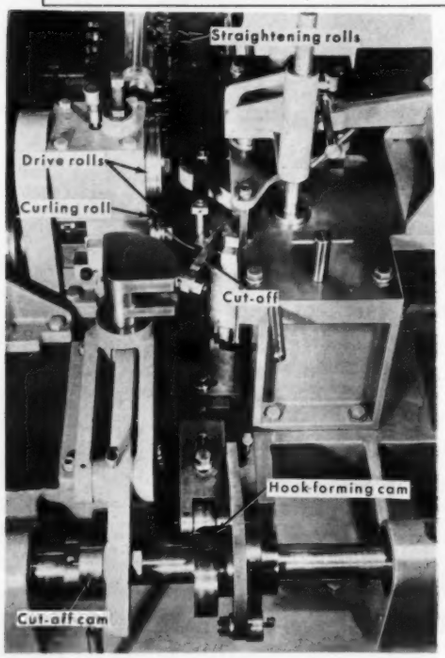
As a safety measure, the handwheel of the bail-forming machine is connected electrically so engagement of the handwheel automatically cuts off the power. The handwheel is used for advancing the wire during start-up.

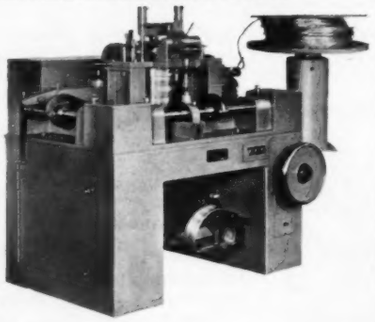
The automatic wire-bail machine is made by the Hopkins Machine Corp., Chicago, Ill.

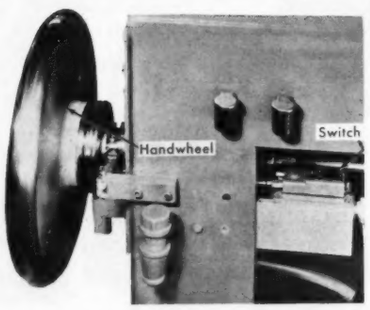


Curling Roll Form Wire Bails









ADVANTAGES OF FLEXIBLE SHAFTING

For Power Drive & Remote Control

by C. Hotchkiss, Jr.
Application Engineer,
Stow Manufacturing Co.

Flexible shafting has the following advantages over other type drives:

1—it is often the simplest method of transmitting power between two points which are not collinear or which have relative motion

2—eliminates exposed revolving parts

3—does not require accurate alignment

4—easy to install and maintain

Not Collinear – Where it is necessary to connect two shafts which are not collinear, a simple arrangement of a single belt or two universal joints will often do the job accurately. But, in many cases where the path of transmission is more complicated and would require a more expensive arrangement of mechanical components, flexible shafting provides a simple, low cost, efficient drive which is easy to install because it does not require accurate alignment. See example, figure 1, in which a 1¼ inch Stow flexible shaft is used to drive the auger on a G.L.F. bulk feed truck.

Flexible shafting also allows the designer greater freedom in locating either the drive or the driven component on a piece of equipment.

Fig. 1
Relative Motion—Where two shafts which have relative motion must be connected, flexible shafting is often the ideal means of transmission. In many cases it eliminates a much more complicated drive which would, necessarily, include telescopic joints; further, it eliminates the danger of exposed moving parts. See figure 2, which shows a ¾ inch Stow flexible shaft driving an Avery Rake built by the Minneapolis Moline Company.

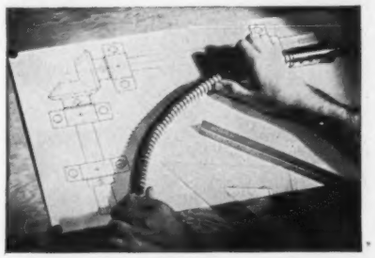


Fig. 2
Other typical applications of this type are used on portable power tools when motors are too heavy to be mounted on the tool—such as portable grinders, sanders, paint scrapers, saws and tree tappers. And, since flexible shafting is not affected by vibration, it is an ideal drive for applications where a high degree of vibration is involved—such as in vibration testing tables and concrete vibrators.

Stow flexible shafts are available: for power drive applications in diameter sizes from ⅛ inch to 1¼ inches; for remote control applications in diameter sizes from ⅛ inch to 1⅝ inches. The 1¼ inch power drive shaft will transmit up to 10 HP while the 1⅝ inch remote control shaft will transmit up to 4000 lb. in.

For complete engineering data on flexible shafting, including selection charts, write for engineering Bulletin 570.

STOW MANUFACTURING COMPANY
308 SHEAR STREET, BINGHAMTON, NEW YORK
Circle 23 on Reader-Service Card for more information

Lightmeter Varies Dashpot Intake to Set Camera's

Celestino O. Lubatti, Italian Editor

WHEN RELEASE KNOB is set for automatic timing (A position), time disc is turned to 1/300 sec (highest shutter speed). Exposure meter then indicates actual shutter speed. Hand lever advances film and loads shutter through internal rack-and-piston drive.

Air flow to a dashpot is varied by the exposure meter for continuous automatic control of shutter speed in a novel 35-mm camera. The throttled dashpot takes into account brightness changes occurring even shortly before exposure. Simple operation and reliable, accurate performance of the camera are claimed.

A swing plate on the galvanometer-pointer throttles the inlet aperture of the dashpot cylinder. Retarding force developed on the piston is infinitely variable and inversely proportional to the amount of light received. A rocker arm, spring-loaded to offset inertia effects of piston and arm on shutter drive, connects the piston rod with a crank on the shutter-loading gear.

The balanced dashpot, a development of Durst SpA, Bolzano, Italy, can be released to allow manual setting of exposure time.

LIMA variable speed drive

LIMA'S multi-speed transmission, as a component of the VARIABLE SPEED DRIVE, delivers this greater output torque . . . at no more cost than comparable 2 to 1 ratio units.

- 120 through 1200 RPM with a 1200 RPM motor
- 180 through 1800 RPM with a 1800 RPM motor

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for additional information write:
Patrick F. Dwyer,
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- STRAIGHT LINE REDUCERS
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NEW!
a SMALLER 10 Amp Relay with INDUSTRIAL FEATURES

for direct connection or plug-in

- Three mounting arrangements
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- Molded coil
- No solder joints
- Optional pilot light
- Non-breakable nylon dust cover

Relay shown with dust cover removed

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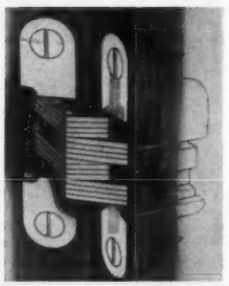
NEW INVISIBLE HINGES

General Purpose Hinge Creates Flush Surfaces

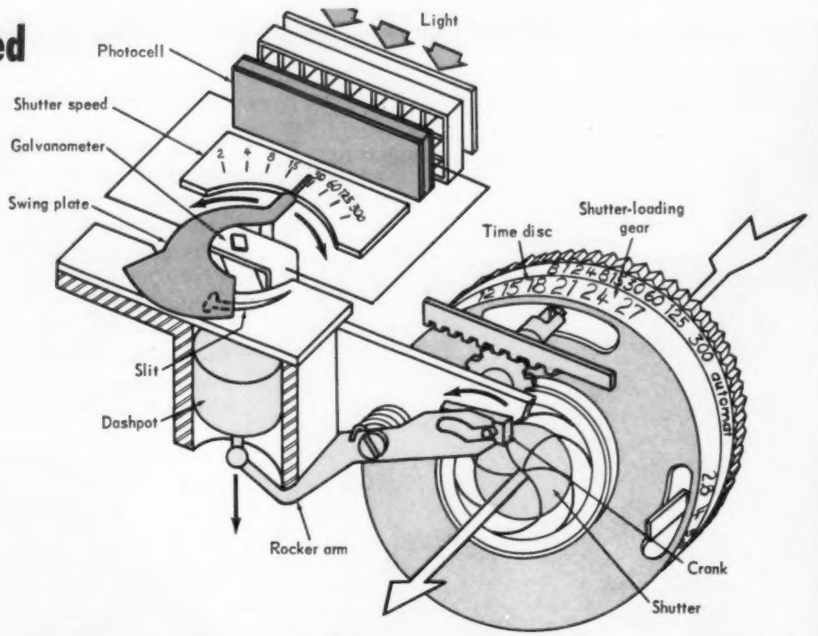


These hinges are completely hidden from view when door, lid or hood is closed. Makes possible flush, absolutely smooth surfaces that greatly enhance appearance and safety. Tapered body sections are precision castings of a special zinc base alloy having a tensile strength of 47,000 pounds per square inch. Operates in a 180 degree arc which permits full opening. Laminated link construction reduces friction and permits hinges to operate freely and smoothly. Hinges are reversible and may be used right or left hand. Available for wood or metal application in a wide variety of sizes.

SOSS MANUFACTURING COMPANY, Dept. DN-27, P. O. Box 38, Harper Station, Detroit 13, Michigan.

Circle 26 on Reader-Service Card for more information

Exposure Speed



GALVANOMETER POINTER varies opening of throttle slit as brightness changes are detected by photocell. Slit is wedge-shaped to make dashpot retarding force inversely proportional to amount of light.

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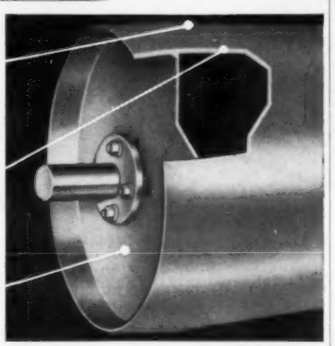
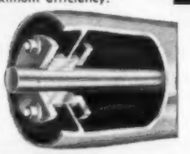
NEW CURVE CROWN® WELDED ALL-STEEL PULLEYS
STEPHENS-ADAMSON

*CURVE CROWN DESIGN
Accurately formed Curve Crown on rim outer ends eliminates belt stretch and wear . . . increases belt training effect more than 100%.

STURDY RIM CONSTRUCTION
Absolutely round one piece pulley rims formed under hydrostatic pressure. Seam machine-welded inside and out insures 100% weld penetration.

ACCURATE END PLATE ASSEMBLY
End plates O.D. and I.D. machined to insure concentricity between bore and outer rim. Pressed fit . . . submerged arc welding for maximum efficiency.





FEATURING "SQUEEZELOCK" HUB DESIGN
Revolutionary "Squeezelock" Hub design provides gripping power for full torque transmission without keyways plus eliminating distorting loads against pulley end plates.

*PATENT APPLIED FOR

S-A

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STANDARD PRODUCTS DIVISION
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CABLE: ARLAB

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When you require complex parts...

Specify Precision Forgings by WILLIAMS

The forging illustrated is one half of a housing for an aircraft weapons system furnished to the Springfield Armory. Its precision manufacture, from design to finished forging, is typical of all Williams' forgings, large and small.

1. Overall design improved by Williams to include forged lugs and bosses which were formerly attached by welding.

2. Starting with a 5" square billet of 4340 steel weighing 51 lbs. this forging required extreme displacement of metal to form its half round shape with such a wide range of complex thick to thin sections. Finished weight, 30 lbs.

3. The ingenuity of our die designers made possible the intricate dies required for trimming and "punch-out" that would conform to the varying planes and sectional thicknesses.

4. Forgings were normalized and heat-treated to a Brinell hardness of 255-302.

5. Comprehensive inspection of finished forgings complied with rigid ordnance inspection requirements.

If its forgeable... from carbon, alloy or stainless steel, monel, brass, bronze, copper, aluminum alloys or titanium...
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Send for new 28 page Forging Design Manual No. 60

Includes all necessary design data—tolerance tables, standard practices, specifications, etc. No cost...no obligation.

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Humidifier Pumps and

Lars G. Soderholm, Midwest Editor

A new humidifier uses a rotating cylinder, one end immersed in the water container, to lift the water and to atomize it centrifugally against surrounding heater coils. The vaporized water particles then are carried off by the air stream of a fan that recirculates room air through the humidifier unit.

Because of the dilution of the vaporized water particles with room air, the mixture leaves the humidifier at a temperature of only 5F over the incoming air temperature and at an 85 to 90 per-

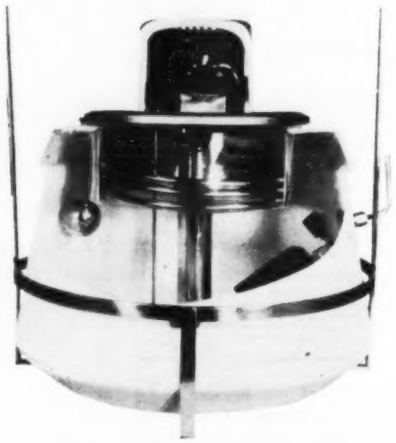
cent relative humidity. This, claims the manufacturer, effectively prevents condensation.

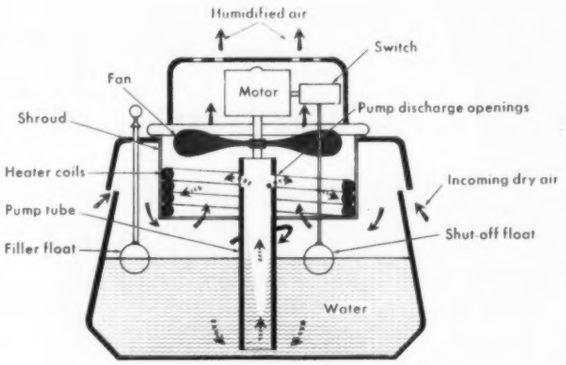
A special, collapsible filling spout that opens up in the same manner as the collapsible camper's drinking cup makes the unit easy to fill with nearly any type of container.

The room humidifier weighs five lb empty and it has a 16-pt water reservoir made of high-density polyethylene. The brass-tube pump unit lifts about 3½ oz of water per minute. Total discharge rate is approximately one lb of water per hour with a conservative air circulation rate of 15 cfm, with the motor operating at 1500 rpm. A float-actuated switch shuts off the unit when water level drops.

The room humidifier is manufactured by Rotherm Engineering Co., Inc., Chicago, Ill.

Atomizes Water Droplets against Heater Coils





HUMIDIFIER WORKING PARTS consist of 1¼-inch-dia brass tube mounted below propeller-type fan on fhp motor. Bottom of brass tube is immersed in water container. Two holes near top of tube permit water to escape after climbing sides of rotating tube. Fan and top of tube are located within humidifier shroud and heating coils. Openings around water container permit air to enter, pass up through shrouded section and be ejected through top.

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ANCHOR
CLAMP-TYPE REUSABLE COUPLINGS
+
TWO AUTOMOTIVE TYPE WRENCHES
=
A QUICK, SURE, LEAKPROOF CONNECTION

Engineers and operators rely on these easily applied, streamlined Anchor Clamp-Type Couplings for fast, emergency repair and field service, as well as original equipment application.

Designed to accommodate normal variations in hose, they can be applied in the field with no tools other than a pair of automotive-type wrenches, and once applied, provide a sure, safe, leakproof connection that will remain intact up to the burst point of 2 and 3-wire braid hose.

Anchor Clamp-Type Reusable Couplings are supplied in high, medium or low pressure styles, for 3-Wire, 2 Heavy Wire, 2-Wire, 1-Wire, and Hi-Burst 2-Rayon Braid Hose, as well as Spiral Wire Suction Hose.

Write for Catalog No. 303

Andy Anchor says: "The Anchor representative is a qualified specialist. Consult him on your hydraulic plumbing problems."

ANCHOR COUPLING CO. INC.
307 North Fourth St., Libertyville, Ill.
Branch Plants: Dallas, Texas; Plymouth, Mich.

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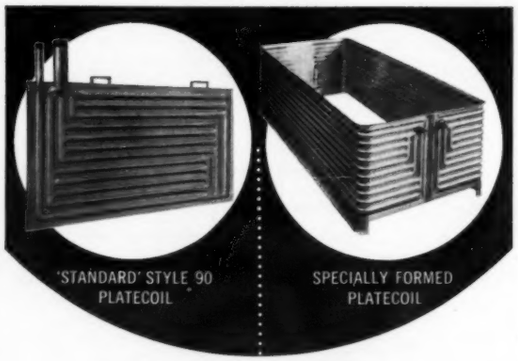

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boosts efficiency in all kinds of tank and process heating and cooling — saves on engineering, fabrication and maintenance

PLATECOIL can be engineered and factory-fabricated to exact specifications. Available in a wide range of standard sizes, specially formed or fabricated units, and most weldable metals. Operating pressures up to 250 psig.

WRITE FOR NEW BULLETIN P51

PLATECOIL DIVISION, TRANTER MANUFACTURING, inc.
Lansing 9, Michigan

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LOCK OUT AIR FOR MACHINE REPAIR

Ross
Locks Out and eXhausts VALVE

Lock out air that operates a machine, as a safeguard when making machine repairs. The Ross L-O-X Valve installs in the supply line leading to the machine, upstream of any operating valve. Designed so that when closed, supply-air to the machine is shut off and air downstream is exhausted. Can be padlocked in this position.

More L-O-X valves can be incorporated in the circuit to shut off and exhaust various segments of the circuit. Detented open; very low pressure drop; Lightweight aluminum construction. Call your Ross representative or write for literature.

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58,900 LBS.

That's the *minimum* you get with half-inch diameter Driv-Lok Shear-Proofs. Through all diameters, these remarkable pins give you twice the shear strength of ordinary pins, whether solid or spring type. Installation? Just drill and drive!

Compare for Yourself

For versatile, economical and *positive* fastening, specify Driv-Lok. Give us a call, or write for your free catalog today.

Standard Type A Shear-Proofs (shown) are stock. Samples available on request.

MINIMUM SHEAR VALUES IN POUNDS			
Diameter	Slotted Spring Pins	Coiled Spring Pins HEAVY DUTY	Shear-Proof DRIVE-LOK PINS
3/32"	1000	1030	2040
1/8"	2100	1840	3690
5/32"	3000	2880	5720
3/16"	4400	4140	8240
1/4"	7700	7360	14720
5/16"	11500	11500	22960
3/8"	17600	16580	33160
7/16"	20000	22540	45000
1/2"	25800	29440	58900

DRIV-LOK SALES CORPORATION
711 Park Ave., Sycamore 2, Illinois

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WHY SETTLE FOR LESS WHEN YOU BUY CONVEYOR BELTS?

Buffalo CONVEYOR BELTS
offer you TRIPLE ADVANTAGES at LESS COST!

BUFFALO BELTS are 3 WAYS BETTER . . . deliver more conveying mileage for your dollar! (1) BW & B's *exclusive* WOV-IN-WEAR process weaves these belts TIGHTER for LONGER "fray-free" life. (2) These cotton belts have a "built-in bounce" that resists IMPACT and ABRASION. Nothing normally conveyed Digs, Dents or Destroys them . . . except Old Age! (3) Stiff, hard, plied-up belts which you may be paying a HIGHER price for *resists* rough spots or misalignments in your line . . . wear out fast. Buffalo Belts are extremely FLEXIBLE and when they come to bumps or misalignments, they merely MOLD AROUND or OVER and keep on going without abrasive wear.
Don't settle for "half value" . . . get the prices and the pluses of BUFFALO Conveyor Belt. 200 sizes, 35 widths, and 7 thicknesses.

6 SPECIAL SURFACES
Belts specially treated to resist weather, water, acid, oil, grease, alkalies, high or low temperatures, extremely rough material or to handle pure food.

WRITE FOR 14 PAGE MANUAL
Prices, pictures and practical suggestions on what belt to choose from our complete line.

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We also manufacture a complete line of WEBBINGS *and* PURE SHEET RUBBER

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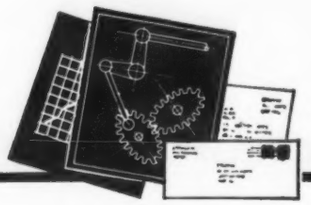
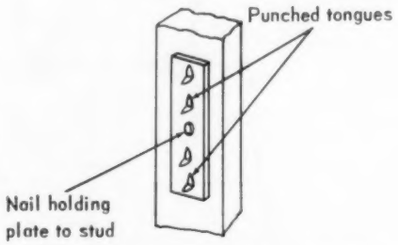
IDEA MART
DESIGN NEWS



DESIRED

Hidden Nailing



We are makers of wallboard which is generally face-nailed to the studding. We were wondering if you know of a method of "hidden nailing". By this we mean that possibly the nailing unit would be nailed to the studding and have outward projections to which the wallboard would be fastened.

Any suggestions that you may give us will be appreciated. Write J. D. H., Idea Mart, DESIGN NEWS, 20 N. Wacker Dr., Chicago 6, Ill.

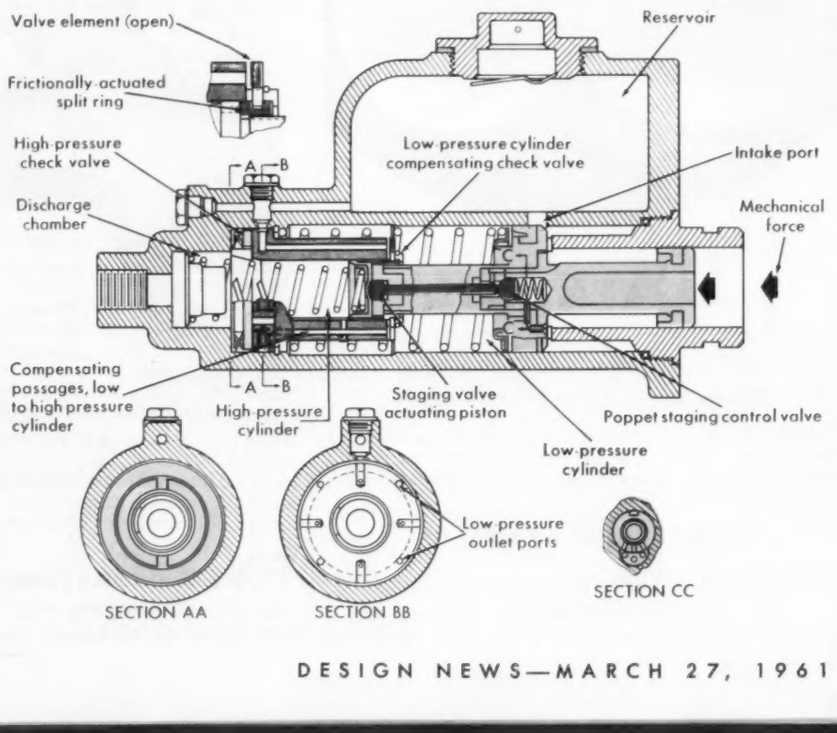
Ideas described in this department are in varying stages of development. They are somewhere between initial conception and the prototype stage.

AVAILABLE

Compound Master Cylinder

This compound master cylinder features a simplified poppet-type staging (transition) control valve with a friction and fluid pressure-actuated check valve controlling fluid compensation between a supply reservoir and the low-pressure cylinder.

The staging valve is coaxially incorporated in the piston-carrying member. The latter includes

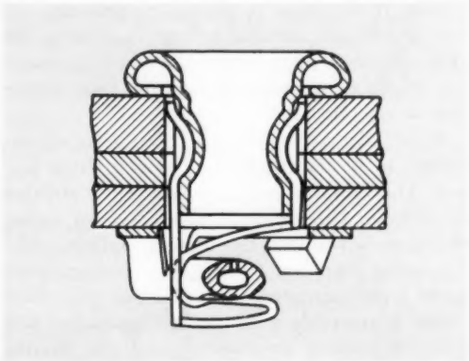


AVAILABLE

Quarter-Turn Fastener

Advantages of this patented fastener, as compared to the others in the same category, include: light weight, compact size with minimum area required, self retention of stud in top plate and no slip between stud and wrench.

It is important to point out that the stud could be any shape to suit different applications and the lower pin attached to the bottom plate could be a "Rollpin", wire, cotter pin or any other type of retainer. Write H. C., Idea Mart, DESIGN NEWS, 20 N. Wacker Dr., Chicago 6, Ill.



for Brake Systems

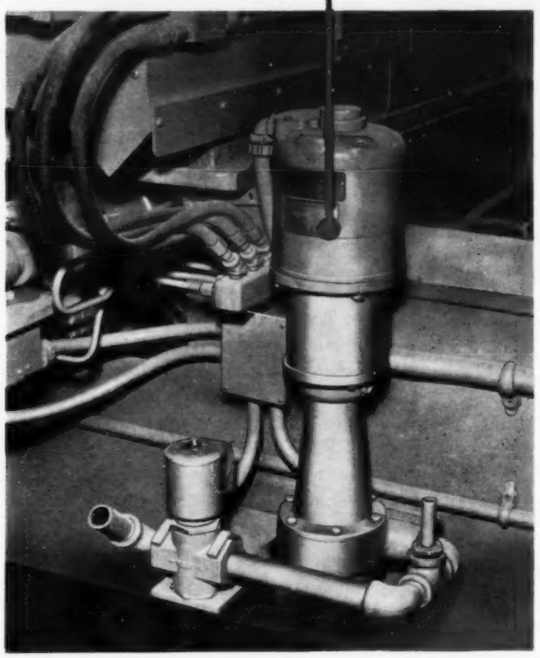
the low- and high-pressure pistons movable as a unit. This staging valve produces a sensitized transition from low- to high-pressure operation. Less brake-pedal stroke is required, therefore, for phasing from low-pressure into high-pressure operation of the brakes.

The check valve controls opening and closing of compensating passages incorporated in the high-pressure cylinder wall and serves both pressure-working cylinders. The wall of the high-pressure cylinder has a reduced portion formed by diminishing its inner end portion, mounting the annular check-valve element. The check valve slides over several passages circumferentially spaced in the high-pressure cylinder wall.

Two pairs of diametrically opposed cross-slots are formed in the reduced portion. Four radial lugs, circumferentially spaced, match the spacing of the cross-slots. These lugs project through cross-slots into engagement with an annular groove formed in the peripheral surface of a split contractible actuating ring. This provides conjoint axial movement of the check valve and ring. The ring encircles a reduced portion on the piston-carrying member which extends rearward from the high-pressure piston head. This ring has frictional engagement with reduced portion to impart limited reciprocal movement to the check valve, moving it to open and closed positions of control with respect to compensating passages.

Movement of the check valve is limited by the space between the face of the normal inner end of the high-pressure cylinder wall and a split retaining ring. This retainer engages a broken annular groove in the outer surface of the slotted portion of the high-pressure cylinder wall. Write G. T. R., Idea Mart, DESIGN NEWS, 20 N. Wacker Dr., Chicago 6, Ill.

. . . pumps for machine builders



In their 100 years of pump progress, Ingersoll-Rand has established a reputation for solving liquid movement problems for machine builders. Famous I-R engineering is unmatched anywhere . . . whatever your design requirements for mounting, flow or pressure, there are thousands of models and types to choose from . . . or we'll make one to suit your most exacting need.

Why not check with the world's foremost centrifugal pump builder regarding your pumping problems. You can get complete details from the pump specialist at your nearby I-R branch office—or direct from our New York headquarters.

over a century IR *of pump progress*

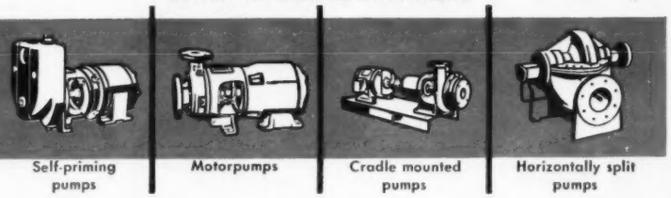
from the leading manufacturer . . .

Ingersoll-Rand

80A9 **11 Broadway, New York 4, N. Y.**

Immersion or sidewall units to 7½ HP for deliveries to 425 gpm, heads to 170 ft.

OTHER I-R PUMPS AVAILABLE



Self-priming pumps | Motorpumps | Cradle mounted pumps | Horizontally split pumps

Circle 36 on Reader-Service Card for more information

PLASTICS
in Design
Engineering

PROPERTY	TEFLON (TFE)	TEFLON (FEP)
Specific Gravity	2.1-2.2	2.1-2.2
Tensile Strength, 73°F	2500-3000 psi[a]	2700-3100 psi
Elongation, 73°F	100-200%	250-330%
Compressive Stress at 1% Offset	1000 psi	700 psi
Impact Strength, Izod Notched, 77°F	3.0 ft. lb./in. of notch	Does not break
Heat Distortion Temp., 66 p.s.i.	270°F	162°F
Coefficient of Linear Thermal Expansion (Approximate Values per °F)	5.5×10^{-5} in./in./°F	5.23×10^{-5} in./in./°F
Dielectric Strength, Short Time, 1/8"	400-500 v/mil[b]	400-500 v/mil[b]
Surface Arc-Resistance	700 seconds[c]	165 seconds[d]
Volume Resistivity	$>10^{15}$ ohm-cm.	2×10^{15} ohm-cm.
Dielectric Constant (60 Cycles)	2.0	2.2
Service Temperature Range (Max.)	+500°F	+400°F
Service Temperature Range (Min.)	−395°F	−395°F
Water Absorption	0.0%	0.0%
Flammability	Nonflammable	Nonflammable

(a) Tensile strength in oriented film may be as high as 15,000 psi.
(b) Value is 1000-2000 v/mil in thicknesses of 5 to 12 mils.
(c) Does not track.
(d) Samples melted in arc after 15 seconds, but did not carbon track.

This table compares the properties of Teflon* TFE and FEP. The newer FEP can be injection molded. In designing, consult your Garlock plastics specialist for best application results.

In designing intricate parts, consider the benefits of Teflon as a material.

Teflon offers a unique combination of properties unmatched by other plastics. It possesses the lowest coefficient of friction, the best non-stick characteristics, the most complete chemical resistance and the widest useable temperature range available in any plastic. Teflon eliminates lubrication, corrosion, contamination, seizing; it reduces friction, wear, space required, weight. Teflon can be used in a thousand different ways—for packings, gaskets and seals . . . for connectors, insulators, and test points . . . for valves, bearings, couplings, and insulation.

In producing intricate Teflon parts, consider the benefits of Garlock as a supplier. From virgin powder to finished piece, Garlock closely controls each step in the process to assure that the final part performs to your expectations. Complete facilities are at your disposal for molding, extruding, and machining of Teflon. If your application calls for special properties, Garlock will compound Teflon with selected fillers to greatly extend its service range. If you need unusually large configurations, Garlock will fusion-weld Teflon . . . the weld will have the same thermal, chemical and electrical properties as the Teflon itself.

Parts made from Nylon, Delrin*, C.T.F.E., Lexan† are also available from Garlock. Let your local Garlock representative quote on your design, or ask his assistance on any design problems concerning materials and applications. Call him at the nearest of the 26 Garlock sales offices throughout the U.S. and Canada. Or, write for Catalog AD-177. Garlock Inc., Palmyra, N.Y.

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PATENTS

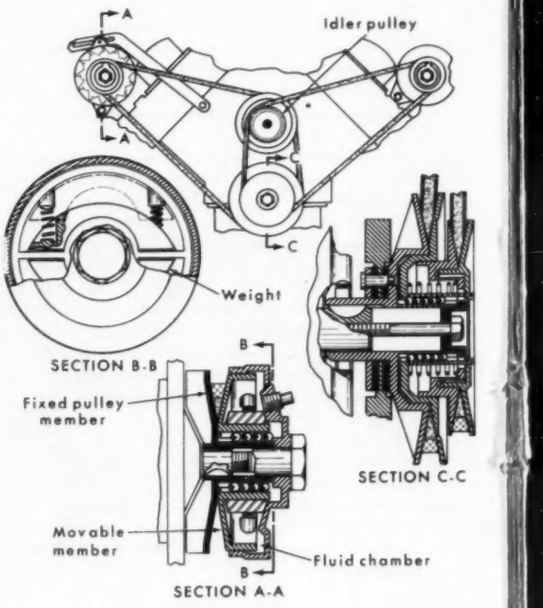
Accessory Drive

U. S. Patent 2,962,910; William S. Wolfram, assignor to General Motors Corp., Detroit, Mich.

This variable-diameter pulley and belt drive is compact, operates against a minimum of frictional resistance and maintains adequate belt tension at all times. A fluid is used as the operating medium, contracting and expanding the pulleys in response to centrifugal force. An auxiliary device is provided, in case the fluid device fails to operate.

A pair of expandable and contractible driven pulleys is coupled by belts to similar drive pulleys. The movable pulley members are slidable on roller or ball elements with a biasing spring arranged to contract the driving pulleys while expanding the driven pulleys. At a predetermined speed, a device comprising a chamber with fluid which is rotatable with the driven pulley will force the pulley to contract and the driving pulleys to expand.

The auxiliary device, utilizing weights, is arranged to operate should the fluid device fail because of leakage. By utilizing fluid as a primary medium, calibration problems are reduced. In this device, the weights are for operation as an auxiliary device only and need not be accurately balanced. The fluid is self-contained, eliminating need for an external force such as a pump.



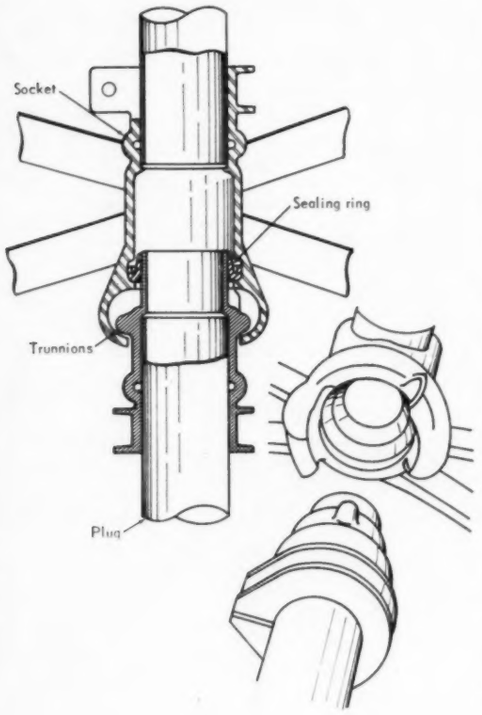
Pipe Coupling

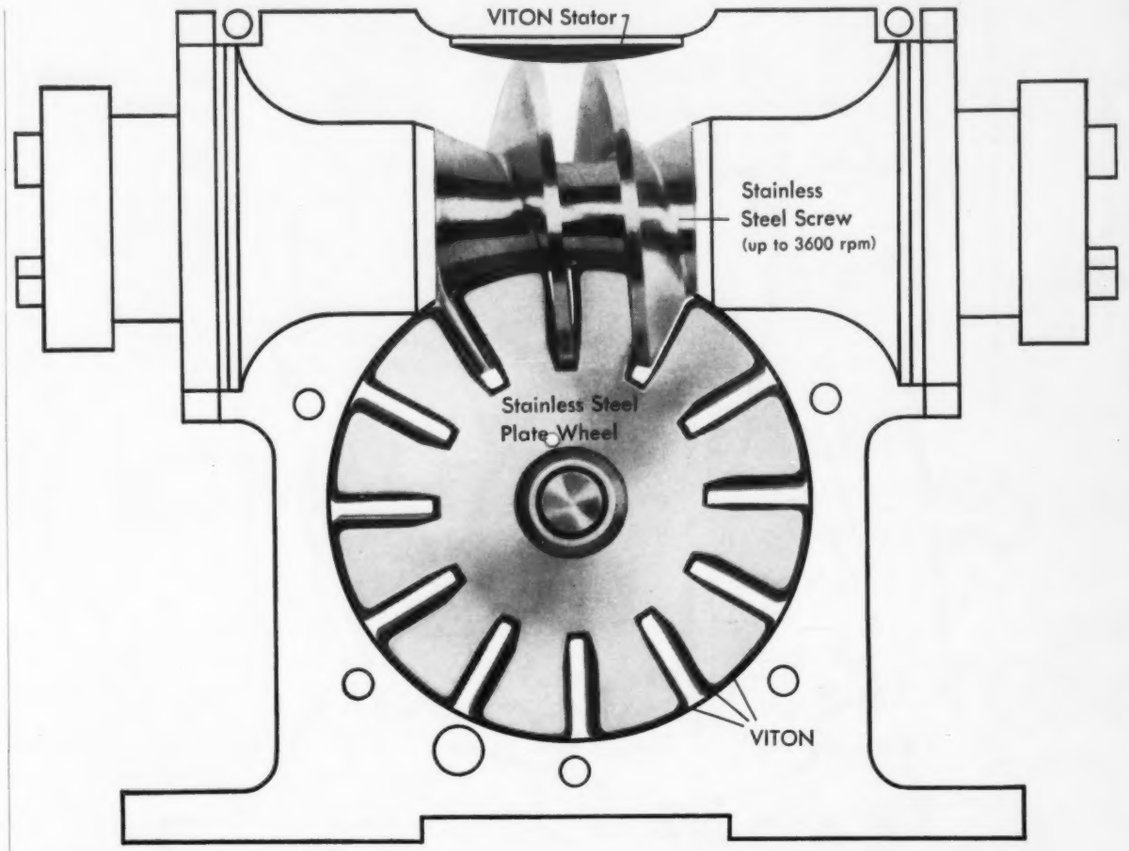
British Patent 855,723; Alfred C. Morrison, Torque Converters, Ltd., Leicester, England.

Comparable with a simple bayonet connection, this pipe coupling is joined by trunnions that engage indentations in circular segmental grooves. Design eliminates latches, hinges, sliding springs or other loose parts usually associated with similar couplings. The coupling permits misalignment up to 20 deg in any radial direction.

Liquid pressure within the pipe is utilized to seal the coupling by distending a U-shaped resilient ring, one leg of which is longer than the other. The longer leg rides against the plug's tapered nose section; the shorter leg is located in an internal groove in the socket. Sealing contact between plug and socket is preserved in whatever direction the pipes are misaligned.

When connecting, the plug is aligned in the socket cavity with its trunnions clear of segmental grooves, then is pushed in until its tapered nose engages the sealing ring. Turning about 90 deg engages the trunnions and indentations within the socket grooves.





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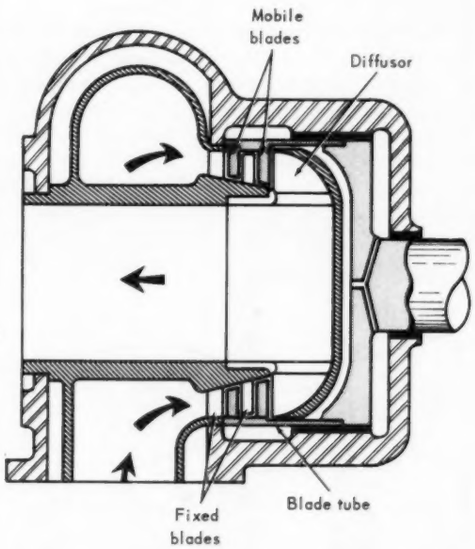
Gas Turbine

French Patent 1,226,960; Klaus William Mikael Kerppola, Finland.

Rotor blades face inward in this turbine design. Thus, blades are in compression during operation and the design permits use of ceramics, which resist compression much better than tension.

Combustion gases from annular chambers pass through the stator and rotor blades to impinge on a diffusor baffle, reversing the gas flow. Exhaust is through the hollow stator tube. The inner end of the rotor shaft is developed into a flange, mounting the tube holding the rotor blades.



The patent includes claims for partially counteracting axial thrust and radial expansion. Drilled passages in the rotor flange admit stator leak gas pressure to the outer face of the rotor flange to reduce thrust. An annular passage cut into the housing around the blade tube permits high-pressure fluid from an outside source to act directly on the blade tube, controlling its expansion. These aids contribute to high efficiency by permitting closer tolerances, since rotor distortion is reduced greatly.

The following list compiled from recent issues of the Patent Gazette gives you increased coverage of new patents whose details may be useful to product and machine designers. Copies may be obtained from the U. S. Commissioner of Patents, Washington, D. C. The price is 25c each.

FLEXIBLE COUPLINGS FOR SHAFTS
U S Patent 2,972,241; Bernhard Hackforth, Wanne-Eickel, Germany.

BALANCE-TESTING DEVICE
U S Patent 2,972,256; Charles W. MacMillan, assignor to Bear Mfg. Co., Rock Island, Ill.

DIFFERENTIAL MECHANISM FOR MOTOR VEHICLES
U S Patent 2,972,265; Maurice Walter, New York, N. Y.

SELF-BROACHING FASTENER
U S Patent 2,972,274; Emerson H. LaBombard, Santa Monica, Calif., and Oscar A. Swanson, Pacific Palisades, Calif.

SEALED-STATOR SUBMERGED ELECTRIC FUEL PUMP
U S Patent 2,972,308; John L. Haggerty, assignor to Thompson Ramo Wooldridge, Inc., Ohio.

PUMP OR MOTOR
U S Patent 2,972,311; Everett L. Baugh, John R. Prior and Wilbur J. Scheutzow, assignors to General Motors Corp., Detroit, Mich.

PRESSURE-DERIVATIVE FEEDBACK VALVE
U S Patent 2,972,338; Wayne B. Lloyd, assignor to Westinghouse Corp., East Pittsburgh, Pa.

VARIABLE BACK-PRESSURE REGULATOR
U S Patent 2,972,359; Arnold S. Joukainen and John E. Povelones, assignors to E. I. duPont de Nemours & Co., Wilmington, Del.

FASTENING DEVICE
U S Patent 2,972,367; William C. Wooton, assignor to United-Carr Fastener Corp., Cambridge, Mass.

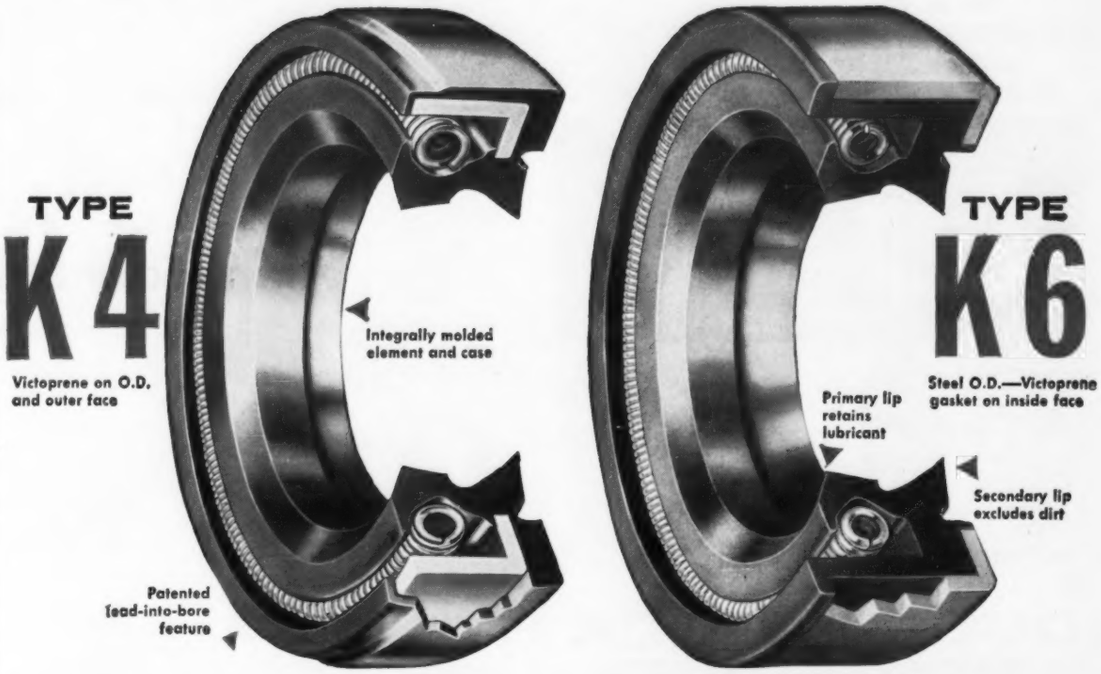
AUTOMOBILE FAN DRIVE
U S Patent 2,972,398; Frederick L. Davis, assignor to Welex, Inc., Ft. Worth, Tex.

SQUARE COMPUTING DEVICE
U S Patent 2,972,443; Robert B. Watrous, assignor to Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

FLEXIBLE CONDUIT VALVE
U S Patent 2,972,464; Sam A. Jones, Pittsburgh, Pa., and Joseph P. Echtler, Jr., Bridgeville, Pa.

MAGNETICALLY OPERATED ACTUATOR
U S Patent 2,972,467; Wilbert M. Gilman, assignor to Rivett Lathe & Grinder, Inc., Brighton, Mass.

HYDRAULIC QUICK DISCONNECT
U S Patent 2,972,491; Victor C. Dutton, assignor to The Gabriel Co., Cleveland, Ohio.



Newest design for compact dual-lip sealing

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In Type K4 Victoprene oil seal and its variant, Type K6, Victor offers a highly improved version of compound element shaft sealing. The two types accommodate varying installation and bore sealing needs, yet provide identical shaft sealing efficiency in the smallest housing space.

Check the design features. See how these seals can enhance your specifications for all types of machinery or automotive applications. You'll like their moderate price, too—and fast availability in all standard sizes! See your Victor Oil Seal Engineering Catalog No. 306.

DUAL SEALING SURFACES—Inner lip designed for maximum fluid retention. Outer lip excludes foreign matter or confines a secondary lubricant.

VICTOPRENE ELEMENT—Developed of improved Buna N synthetic rubber for balanced resistance to lubricants, heat, and age deterioration.

PRE-LUBRICATION CAVITY between lips provides for permanent lubrication on installation. Reduces frictional drag; extends seal life.

SPACE-SAVING NARROW WIDTH — Patented one-piece, integrally molded element and case construction permits most compact seal housing.

POSITIVE SPRING LOCATION—Molded groove in sealing element holds garter spring in proper place to keep uniform pressure on shaft.

POSITIVE BORE SEALING—*Type K4* has bonded-to-case Victoprene on O.D. and outer face. Patented lead-in feature aligns seal for easy installation. *Type K6*, for metal-to-metal installations, has steel O.D., with integral gasket on inside face for bottom of bore seal.

TYPICAL APPLICATIONS—Wheel bearing seals on automotive vehicles, farm and road machinery, etc.; crankshaft; pinion; automotive transmission (rear extension housings); speed reducers; winches, etc.

K4 and K6 seals supplied without spring where it is not required

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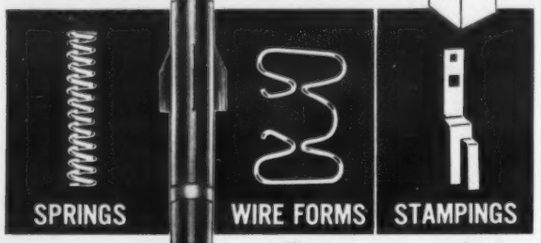

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DESIGN NEWS
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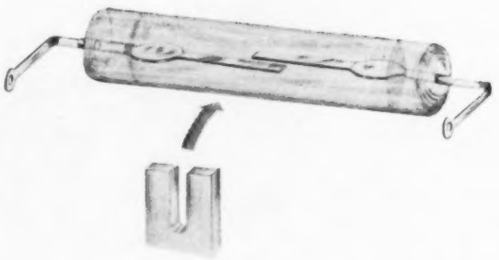
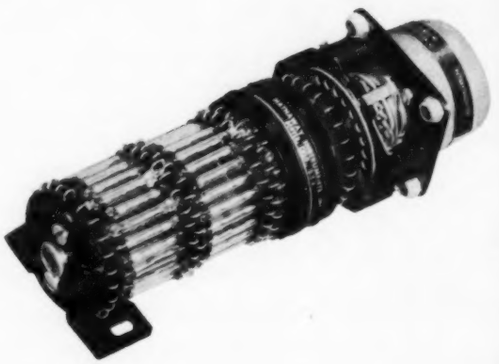
Hermetically Sealed Contacts in Rotary Switch

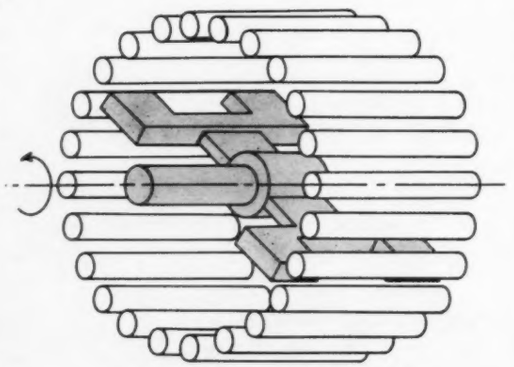
Paul R. Taylor, Assistant Editor



ENLARGED DRAWING of hermetically sealed individual contact shows position of magnet to cantilever leaf. As magnet is drawn away from glass envelope, flux decreases to point where magnetic force can no longer resist natural spring force of fixed cantilevers, and contacts open. Eyelet-shaped terminals provide convenient solder connection.

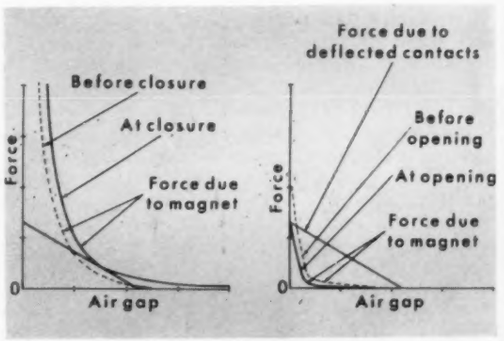


NO SPECIAL LUBRICATION or immersion techniques are necessary for assembled switch. Switch capability is 15 steps per sec. Unit is 6-pole, 12-position, with overall length of 5 inches. Others are available in 3-pole, 24 position; 9-pole, 8-position, or combinations adding to total of 72 contacts. O-rings hold protective covers over switch for easy accessibility. Life of switch is limited by stepping motor.



SWITCH SECTION

SWITCH design places 24 contacts around periphery of shaft holding 1, 2, 3, 4, 6 and 8 V-shaped magnets. Each deck can provide from single-pole, 24-position (with 1 magnet) to 8-pole, 3-position operation (with 8 magnets).



FORCE versus gap curve shows square law of force in magnetic circuit operating to advantage. Short cantilever wires which comprise contacts are low in mass and high in spring force, producing high natural frequency.

Close Magnetically

Hermetically sealed, cantilever-type contacts, consisting of two gold-plated magnetic wires, are suspended close to each other in a glass envelope filled with nitrogen. The glass holds wires rigidly at correct spacing. When a V-magnet is brought in proximity to the envelope with one pole adjacent to each wire, the wires assume opposite polarities and attract, closing the switch. Operation is similar to all magnetic circuits; the force holding contacts closed at zero-air-gap is high compared to the force before the gap closes.

Each contact can operate individually instead of with a "common". A 2-pole, 12-position deck can be operated with any one or all contacts operated individually as a single switch—with both ends available—in sequence as the magnets are stepped. It also can be operated as a standard 2-pole, 12-position deck by strapping together any 12 adjacent contacts on one end to form the "common".

Holding force of the contacts under the influence of a magnet, along with the high natural frequency, prevents contact noise at high vibration levels for normally closed contact.

Contact life is increased at current levels below 0.1 amp and decreased at levels above 0.1 amp. Breakdown voltage across open contacts exceeds 500v, 60 cycles, a-c. Thermal emf under normal operating conditions into infinite resistance does not exceed 50 microvolts.

Normally closed contacts can be provided by supplying an additional bias magnet with a field of opposite polarity to operating magnet. The bias magnet then holds the contact closed until rotating magnet cancels its field, at which time it releases. Bias magnets normally are provided for each individual contact around the outside periphery.

Design of this rotary step switch was prompted by the need for a high vibration-resistant unit capable of withstanding the stringent specifications of MIL-E-5272B.

The type RSA rotary switch is manufactured by Hathaway Denver, Div. of Hathaway Instruments, Inc., Denver, Colo.

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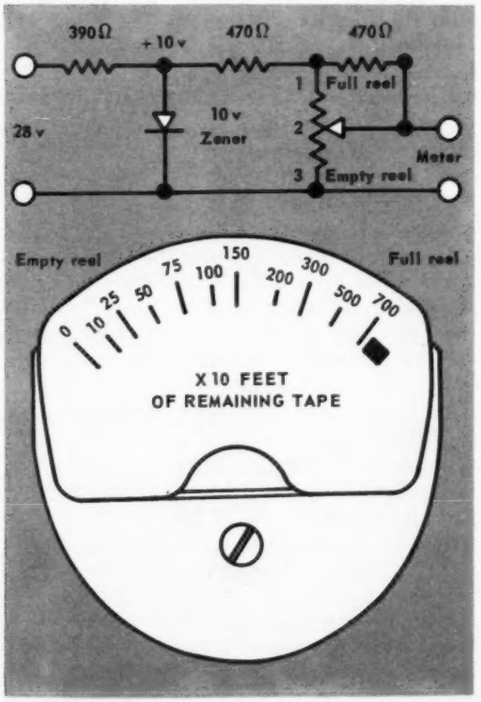
Shunted Potentiometer

Edward W. Schrader, Western Editor

The nonlinear output of a shunted potentiometer gives an expanded scale to read magnetic tape footage in a tape transport. The sensing device measures the remaining tape footage on the storage reel.

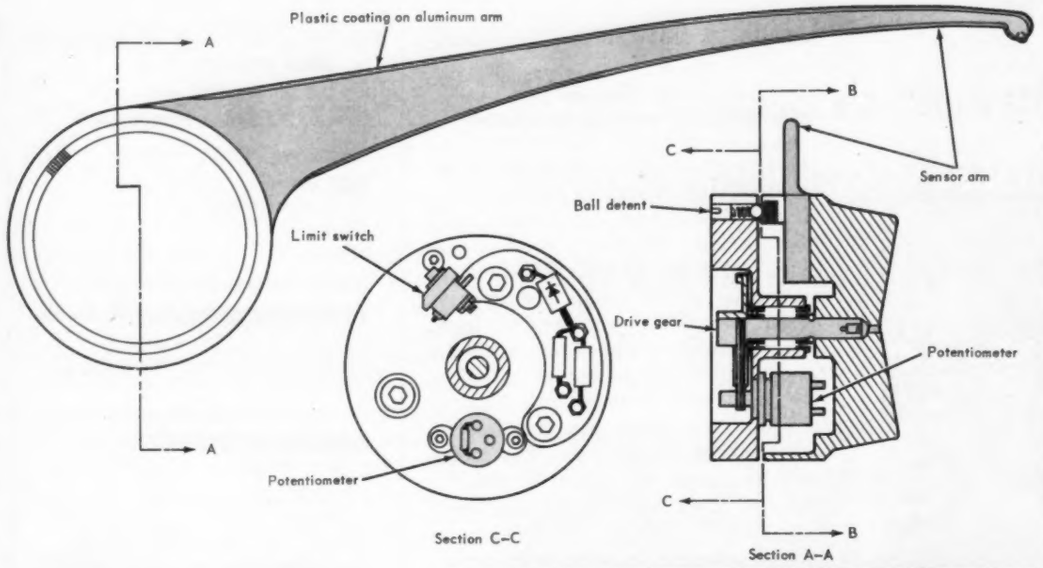
A white sapphire button on the end of a sensing arm rests upon the magnetic tape stored in its reel. As the tape is consumed, the arm moves in an arc about its pivot point; a light hairspring and gravity apply a force of 1.5 oz to maintain contact with the roll of tape. A gear on the pivoting sensor arm turns the potentiometer, which provides a position signal. The gears have a 6:1 ratio to amplify the 30-deg movement of the sensor arm to a 180-deg potentiometer movement.

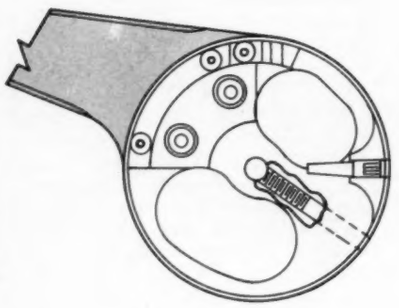
The face of a microammeter is calibrated in



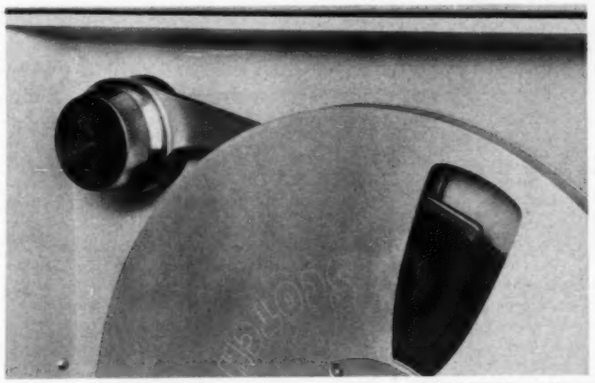
ELECTRICAL SCHEMATIC of shunted potentiometer in sensor pick-up assembly. In position 1, ammeter measures maximum current, or full reel; in position 2, at mid-reel and mid-potentiometer, microammeter current is greater than ½ because of parallel resistance; in position 3, current is minimum with maximum resistance in circuit.

Expands Low End of Scale in Tape Sensor





Section B–B



SENSOR ARM pivots to rotate potentiometer, thus measuring amount of tape remaining on reel. Plastic coating on aluminum sensor arm damps vibration in arm by restricting beam deflection caused by inherent eccentricities in tape on storage reel. Meter is normally calibrated for 0.001-inch-thick "Mylar" tape, but may be adjusted for other tape sizes.

number of feet of tape remaining on the storage reel. The scale is nonlinear. Scale divisions are expanded on the low end and are contracted at the full reel or high end. As the number of remaining feet of tape diminishes on the storage reel, the larger scale divisions give better resolution to the reading.

In addition to sensing remaining tape footage, the device may be used to sound an alarm or to switch tape-transport systems at the end of a reel. This is accomplished by means of a limit switch located in the extreme position of the sensor arm.

A knurled knob permits manual pivoting of the sensor arm in order to exchange tape reels. A ball detent holds the arm in an up position for the reel-changing operation.

The sensing device is furnished as optional equipment on magnetic tape systems. It is a design development of The Mincom Div., Minnesota Mining & Mfg. Co., Los Angeles, Calif.

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Model KF Knob and Dial Flow Control Valve or Model KN Needle Valve.
Model PF Knob and Dial Flow Control Valve or Model PN Needle Valve for panel mounting.
Model C Check Valve for In-Line Mounting.

TYPICAL APPLICATIONS
ARROW INDICATES DIRECTION OF CONTROL
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TWO DIRECTION CONTROL
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Especially useful for electrical insulation, or for control of electrolytic corrosion between dissimilar metals.
WE'LL SEND YOU COMPLETE FACTS BY RETURN MAIL. JUST WRITE
NYLOGRIP PRODUCTS
567 Pleasant St., Watertown, Massachusetts WA 6-0100
NON METALLIC FASTENINGS OF ALL TYPES

Circle 46 on Reader-Service Card for more information

the hallicrafters co.

Leading Manufacturer of
Electronic Equipment Reports . . .

Left to Right: Jim Lawless, Hallicrafters' Chief Draftsman; Mark Pogue, Reproduction Department Head; Frank Krautsak, Bruning Representative.

"Bruning helps, *two ways*, to meet Tight Government Deadlines!"

"It's the *extras* we get from people and equipment that help us meet tight government QRC* contract deadlines," says Jim Lawless, Hallicrafters' chief draftsman. "Bruning products and service are good examples. We've run our Copyflex reproduction machines an average of 77 hours a week. Yet, we've never had a delay because of machine failure, maintenance, or lack of materials. Another big extra has been the help of the Bruning Representative who has saved us many hours of work with everything from intermediates to electric erasers."

Why not make Hallicrafters' experience your basis for investigating Bruning?

*Quick Reaction Capabilities.

BRUNING

Charles Bruning Company, Inc. Dept. 3-X
1800 Central Rd., Mt. Prospect, Ill.
Offices in Principal U. S. Cities
In Canada: 103 Church St., Toronto 1, Ont.

Please send me information about your reproduction and drafting products and service.

Name_____ Title_____

Company_____

Address_____

City_____ Co._____ State_____

Circle 47 on Reader-Service Card for more information

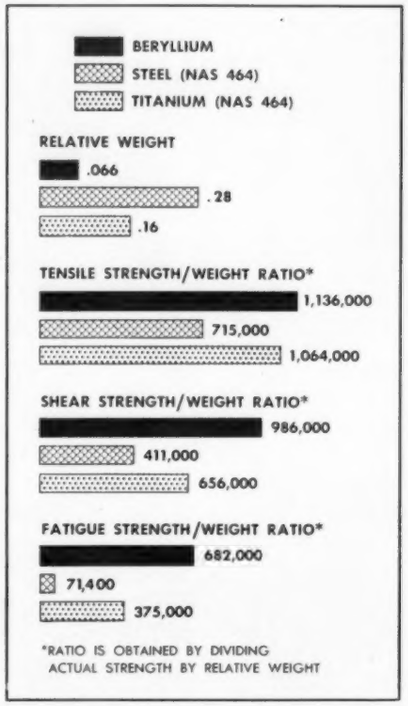
NEW PRODUCTS

Beryllium Fasteners 301

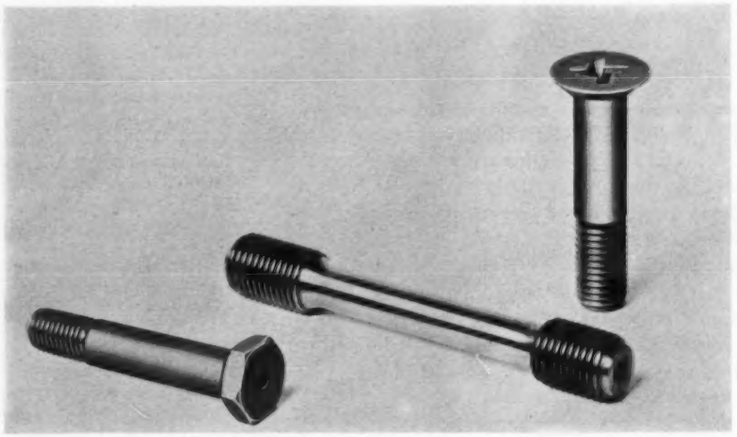
Cut Weight In Missile and Space Craft

One-fourth the weight of steel, beryllium metal has high nuclear properties and is an exceptional heat-sink material with high thermal conductivity. It has atmospheric corrosion resistance equivalent to aluminum and has a high melting point (2350F). Physical properties of the featherweight bolts include a minimum shear strength of 60,000 psi and an endurance (fatigue) limit of 45,000 psi. Bolts in standard shear bolt configurations in No. 6 through ⅜-inch dia sizes are offered—as well as customer's special headed and threaded parts to comparable physical properties. To obtain the optimum in weight saving, aluminum locknut, part SPS-56426, is offered for use on beryllium shear bolts. This companion unit is produced with a larger tap drill hole to mate with the 55-percent thread and to impart high mechanical strength to fastener assembly.

Standard Pressed Steel Co., Jenkintown, Pa.



BERYLLIUM-TITANIUM-STEEL. Various strength-weight ratios of beryllium bolt are compared with standard aircraft titanium and steel shear bolts of same basic type and configuration.



For more information on products described, circle on the Reader-Service Card the numbers appearing opposite the story headlines and drop the card in the mail.

Permanent-Magnet D-C Motor 302

Measures 7/8 Inch in Dia, Less than 2 Inches in Length

The PM-1 motor features a cast, cylindrical, non-oriented, ceramic field magnet, permanently stabilized to resist demagnetization resulting from extreme temperature changes or operation in an environment of a-c magnetic flux. Ceramic field provides shielding of armature flux from outside electronic circuits associated with motor operation. A steel housing shell provides self-shielding of entire motor from outside a-c fields and protects associated electronic networks from inter-

ference caused by motor commutation. A governor may be supplied to control armature speed for applications requiring accuracy within 0.5 percent of nominal speed under wide terminal voltage and load torque variations. Altitude-treated, silver-graphite brushes are held in molded seats, with especially designed prestressed springs for uniform brush pressure throughout long brush life in excess of 1000 hr. The unit has operated successfully from —55 to 100C, under vibration, shock and acceleration satisfying military specifications. Other models of this unit are obtainable which feature sleeve or ball bearings, servo-type gearheads, motor operation for 3-30v d-c and shaft and mounting dimensions to suit customer applications.

Reflectone Electronics, Inc., Stamford, Conn.

Is there an idea here for you?

Du Pont combines elastomers with fabrics to make versatile FAIRPRENE® —a design material of many uses.

Here's how "Fairprene" is serving industry:

Diaphragms for:
Carburetors
Compressors
Control Devices
Flow Meters
Fuel Pumps
Distributors

Fabricated into:
Pneumatic Shelters
Radomes
Tarpaulins
Air Foams
Fuel Bags
Missile Blast-Deflection Curtains

Molded into:
Pump Cups
Packings
Meter Bellows

Miscellaneous uses:
Aileron Seals
Bearing Seals
Fire Curtains
Microphone Covers
Gaskets
Top Sheets
Water Seals
Dielectric Sealing Vents

COATING	FABRIC SUBSTRATES				
	COTTON	NYLON	"DACRON"	GLASS	"TEFLON"
NEOPRENE	●	●		●	
BUNA-N	●	●		●	
"FO"	●	●			
BUTYL	●	●			
"HYPALON"**		●	●	●	
ACRYLIC			●	●	
SILICONE			●	●	●
"VITON"**			●	●	●

Which elastomer-fabric combination is best for your application? The chart above shows the various types of "Fairprene"* available. One of these can probably give you the exact "balance" of properties you need . . . extra-high burst strength with oil resistance . . . flex strength with heat resistance . . . or any degree of the properties offered by the individual components. Clip and mail coupon below for a free booklet giving complete details about "Fairprene" coated fabrics.

*"Fairprene" is Du Pont's registered trademark for its coated fabrics, sheet stocks and cements.
**Du Pont's registered trademarks.

INDUSTRIAL COATED FABRICS
SHEET STOCKS · CEMENTS

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING...*THROUGH CHEMISTRY*

E. I. du Pont de Nemours & Co. (Inc.)
Fabrics Division DN-1, Wilmington 98, Delaware

Please send me your booklet about "Fairprene" coated fabrics. I am interested in using a coated fabric for_____

Name_____ Title_____
Firm_____
Address_____
City_____ Zone_____ State_____

Circle 48 on Reader-Service Card for more information

New

ROTO MISSION®

PATENTED

Most versatile transmission ever developed!

ONLY ROTO-MISSION GIVES YOU ALL THESE FEATURES

- Concentric configuration
- Minimum size for a specified torque
- Reduction ratios up to 270:1
- Optional torque capacities for each reduction ratio
- Torques up to 21,850 lb.-ft.
- Requires neither driving pulley nor coupling
- Casehardened helical gears—ground after hardening for perfect engagement
- Reversible
- Progressive overload capacity to the extent that no breakage of gears can result even from the severest abuse
- *Ability to engage or disengage driving action —mechanically, pneumatically, hydraulically or electrically
- *Ability to provide load releasing, load limiting or overload alarm
- *Ability to provide 2-speed operation

*Standardized accessories to provide these features are available for all sizes of Roto-Mission from stock. This results in a single responsibility for installation performance.

This new rotary transmission design combines a wide range of reduction ratios, high torque capacities, and excellent space-saving characteristics to give you more application versatility than ever before possible. It is designed to be concentrically mounted on a machine drive shaft in place of the drive pulley and operate this shaft at a reduced speed from that of the driving motor. For maximum compactness and convenience, all its parts are inside the casing.

The standard accessories available for each model of Roto-Mission add even greater versatility. Through them you have systems—from a single source—capable of control functions that previously required a number of unmatched units from several suppliers.

Because of its versatility and sound engineering, Roto-Mission permits you to solve design problems far beyond the range of other transmissions —may even permit incorporation of features in your machines that have not previously been possible. For complete information on this new product—how it operates and how it can help you —write today for catalog IR-61.

AIRBORNE®

Engineered Equipment for Aircraft and Industry

AIRBORNE ACCESSORIES CORPORATION

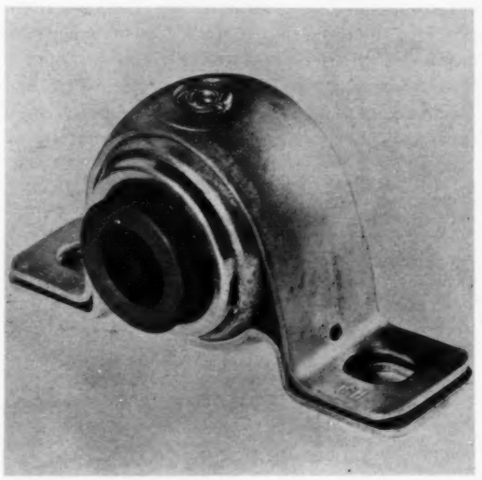
HILLSIDE 5, NEW JERSEY • Offices in Los Angeles and Dallas

Circle 49 on Reader-Service Card for more information

Sleeve Pillow Block 303

Generates Hydrodynamic Oil Film On Porous Bronze

This self-aligning bearing operates with unground shafting, since inner and outer races are integral parts of the assembly. According to the manufacturer, it features a lifetime recirculatory oiling system. As the cutaway drawing illustrates, bearing is a sintered bronze stationary bushing inside a die-cast zinc housing, with space between for reservoir of lubricant. Inside the bearing is an integral hardened-steel rotating sleeve. Load placed on integral sleeve compacts bronze to form solid surface beneath load. Compacting action is assisted by a lubrication technique which prevents seizure until process is completed. By eliminating metal-to-metal contact between rotating inner sleeve and stationary bushing, oil film minimizes friction, heat buildup and vibration. The unit is designed to handle loads in the range of 50 psi at speeds of 1750 rpm or more. It can handle moderate thrust loads. The pillow block is available in three bores: ½, ⅝ and ¾ inch.



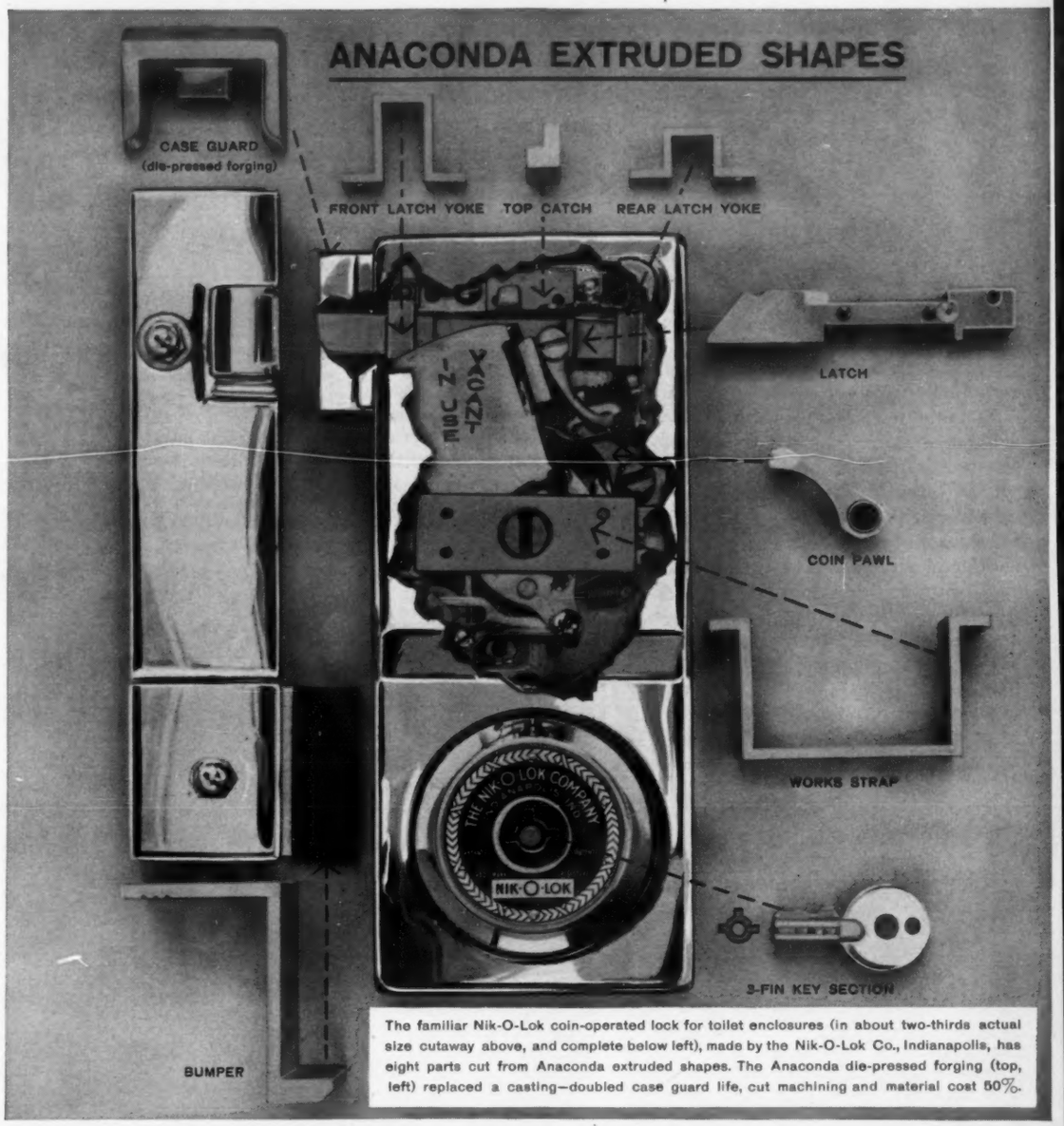
Tann Corp., Congress Drives Div., 3750 E. Outer Dr., Detroit 34, Mich.

Air Rotary Actuator 304

Completes 90-Deg Stroke Within 30 to 40 Millisec

Applications that require speed, compactness and overall system simplification prompted the design of the "Series 50" air rotary actuator. The miniaturized, high-speed, pneumatic unit fits a 1½- by 2-inch package, requires only 0.16 cu in of air to displace its piston and is engineered for low initial as well as low maintenance cost. It has no shaft seals and requires no linkages. Action on output shaft is direct; torque produced at 120 psi is 6. 5 lb-in. Piston action is converted into rotary motion on output shaft through an internal combination of bearings and inclined-plane principle. Prototype quantities of this series are available for immediate delivery. Six additional models, ranging from 1-5/16 to 4⅞ inches in dia and capable of producing from 1.35 to 94 lb-in of torque, are designed for future production.

Ledex, Inc., New Product Sales, 123 Webster St., Dayton 2, Ohio.

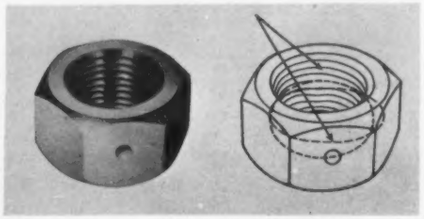


The familiar Nik-O-Lok coin-operated lock for toilet enclosures (in about two-thirds actual size cutaway above, and complete below left), made by the Nik-O-Lok Co., Indianapolis, has eight parts cut from Anaconda extruded shapes. The Anaconda die-pressed forging (top, left) replaced a casting—doubled case guard life, cut machining and material cost 50%.

How parts sliced from long lengths of "premachined" brass shapes cut costs. It starts in design. You select cross sections which minimize subsequent machining—and scrap. The only limitation is that grooves, slots, etc., must parallel the axis of the extruded bar. The smooth surface of extruded shapes reduces many finishing operations. And high dimensional accuracy simplifies assembly. In addition, you get superior, long-wearing parts that improve the quality of your product, because of the strong, homogeneous wrought-metal structure of extruded shapes. For imaginative and practical help in adapting extruded shapes to the economical production of intricate parts, see your Anaconda representative. Or write: Anaconda American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario. 6143 ANACONDA®

Circle 50 on Reader-Service Card for more information

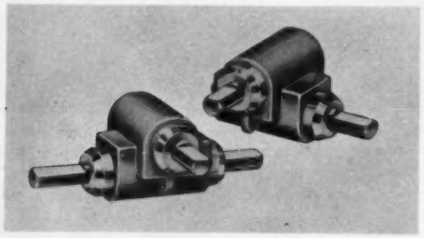
Two-Way Lock Fastener 305



A reusable, double-chamfered lock nut allows application from either side and eliminates need for selective devices. The locking device is in the body of the fastener so that greater locking power is assured when nut is mounted flush with end of bolt or when all threads are not used. The nut uses two locking principles: it is ovalized to give 180-deg spring, and threads are deflected at the point of lock so fastener can be locked in any position. The lock nut is furnished in sizes No. 5 through 1¼ inches—American Standard finished dimensions. Other sizes can be ordered as specials.

MacLean-Fogg Lock Nut Co., 5535 N. Wolcott Ave., Chicago 40, Ill.

Angle Drives 306



The 9056HF (T-Drive) and 9056-119 (Right-Angle Drive) are available with ¼-inch dia shafts cut to a 1/16-inch flat to provide a stronger attachment for coupling ends. Both units are constructed of aluminum-alloy housing steel gears and utilize oilite bearings. They have an ultimate static torque capacity of 25 lb-in with a backlash of 6 deg. They weigh 4 oz and 3½ oz, respectively. Furnished in gear ratios of 1:1, 1:2 and 2:1, other ratios are available upon special request.

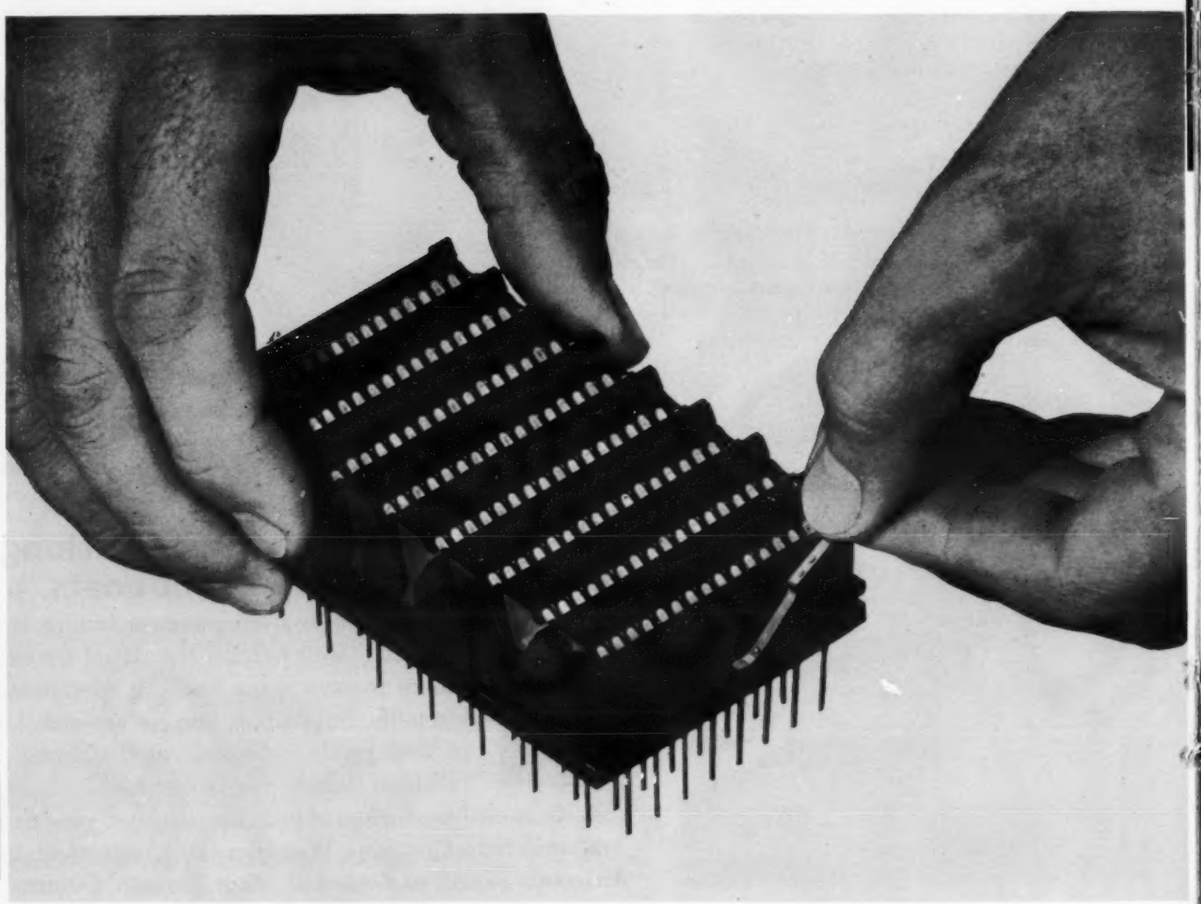
F. W. Stewart Corp., 4311 Ravenswood Ave., Chicago 13, Ill.

SYLVANIA PRODUCES & DELIVERS THE COMPLETED ASSEMBLY

—at substantial savings to IBM

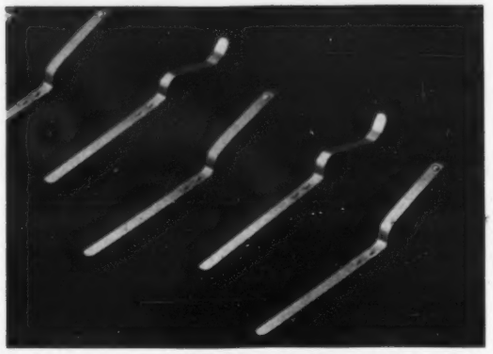
This electrical connector block is a vital link in the electrical system of an IBM computer. Unless it is built to exact tolerances, the computer can malfunction.

To make this critical part, IBM chose Sylvania because we could perform the entire production sequence—from raw materials to completed assemblies built to tolerances in terms of thousandths of an inch. It soon proved the Sylvania experience paid off in two ways: in production economies and in fast delivery too. Total result: a better connector block—at lower cost. (For details see captions to pictures on these pages.) For full information on how Sylvania custom facilities can benefit *you*, or for a quote on a specific project, write Sylvania Electric Products Inc., Parts Division, Warren, Penn.



MOLDED FROM PLASTIC by Sylvania, the IBM connector block meets tightest specifications. This is possible because Sylvania maintains one of the world's most modern and complete lines of automatic molding equipment. This equipment permits Sylvania to handle volume orders for compression, injection and transfer molding. And a unique bank of rotary presses can produce millions of precision parts each day—even using phenolics and urea.

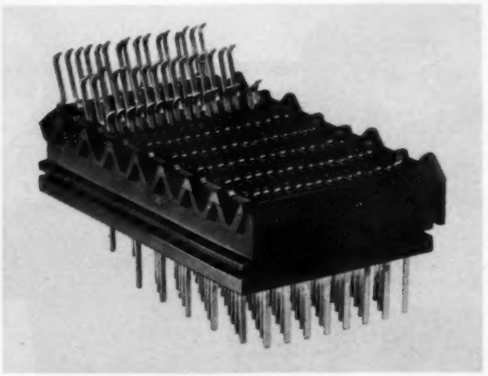
Result to IBM? Precisely formed parts to fill high-volume requirements.



MADE FROM SYLVANIA WIRE, precision-rolled ribbon connectors offer high reliability when the circuitry is completed using wire wrap contact methods. The cross section of the ribbon—.023″ x .062″—and the corner radius of .003″ were accomplished on a special three-head tandem rolling mill and special forming equipment.

Result of this flexibility to IBM? Top reliability at close tolerances.

CUSTOM METAL STAMPING AND DOT WELDING, in one operation, also paid big dividends to IBM. The original plans called for forming parts and then gold-plating the entire contact. Following a request by IBM to extend contact life and reduce costs, Sylvania experience paid off. Sylvania Engineers demonstrated they could weld a tiny gold dot at the contact point economically while maintaining close tolerance on the critical dimensions of the formed contact. High-speed, high-volume techniques enable Sylvania to meet critical deflection and sheer tests. Sylvania maintains a metal stamping facility which includes multi-slide machines, vertical presses, and specially developed machines to help solve your special problems.



CUSTOM ASSEMBLY by Sylvania of the block and the parade of contacts is handled by our corps of trained specialists. Many of our customers have found that Sylvania can often deliver completely assembled and packaged products—using either all Sylvania components or all customer components, or both—*at lower cost than is possible in the customer's own facilities.*

Result to IBM? Many, many thousands of completed top-quality assemblies per month, and to tolerances specified for automatic wire wrap.

QC SERVICE MEANS QUALITY CONTROL!

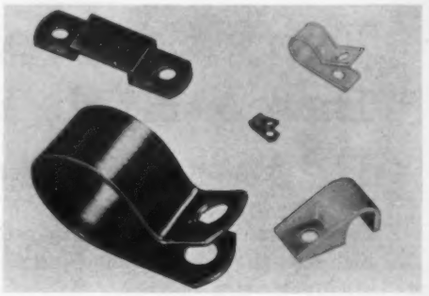
At Sylvania, a tough-minded, hard-to-please quality control department has full authority for assuring the parts Sylvania produces meet your most stringent specifications. Example of this thoroughness: for the IBM connector block, Sylvania used *100% inspection!*

SYLVANIA

Subsidiary of **GENERAL TELEPHONE & ELECTRONICS**

Circle 51 on Reader-Service Card for more information

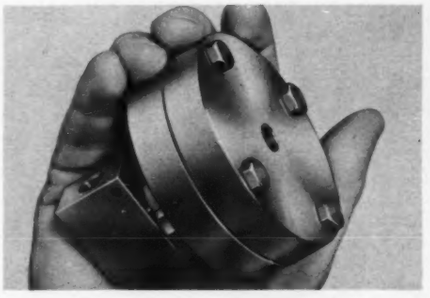
Nylon Cable Clamp 307



Applications from subminiature to large installations are covered with the use of cable clamps for services between —60 to 275F. Smallest unit, Type J, will hold a cable smaller than 1/16 inch in dia. Clamps range from 0.160 inch wide, 0.030 inch thick for extreme close-quarter installation of small work, to 7/8 inch wide, 0.070 inch thick for larger installations. Material used is one of the most solvent-resistant of all nylon types and is unaffected by petroleum oils and greases at temperatures up to 300F. Clamps meet MIL-P-17091A and Amend. 2, 17091B and 20693 Type I; MIL-STD-242A and 242-B (Ships) and MS-39014 (Ord.).

Weckesser Co., Inc., Dept. DN-1, 5701 Northwest Hwy., Chicago 46, Ill.

Air-Operated Valves 308



A compact air operator for on-off use with 1/8-, 1/4-, 3/8- and 9/16-inch tubing valves handles pressures up to 5000 psi. Units are available in both air-to-open and air-to-close designs. Principal uses are in systems requiring remote on-off operation and in relief-valve systems. In relief systems, air-operated valves provide positive reseating and safe operation in event of either air or electrical failure.

'Autoclave Engineers, Inc., 2944 W. 22nd St., Erie, Pa.

Ferry Cap **Countr-bor** Screws Give Barco High Pressure Steam Joints Required Strength At Lowest Cost

Barco Manufacturing Company needs high strength screws of unquestionable quality for high pressure swivel joints capable of handling fluids at 1,000° to 1,200°F or steam at up to 850 psi. Their investigation found that Ferry Cap Countr-bor Screws are the only suitable heat-treated screws that provide tensile strengths of 170,000 psi minimum at moderate cost.

You get these advantages from Ferry Cap Countr-bor Screws:

- Wrench tighter and faster . . . 3 times the gripping surface of socket head screws.
- Fit in standard counterbored holes . . . wrench externally with standard socket wrenches.
- Improve appearance.
- Cost up to 20% less than regular socket head screws.
- High-strength, heat treated alloy steel.
- Sizes from No. 10 through 1".

Free testing samples and literature on request.

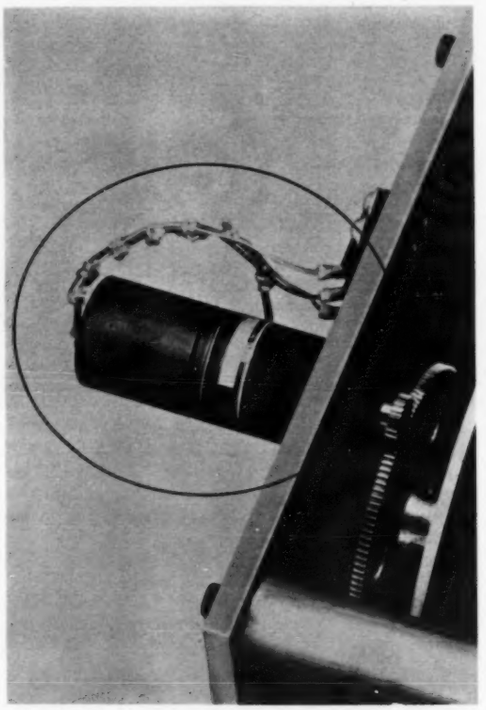
F-C **Ferry Cap & Set Screw Company**

2151 Scranton Road, Cleveland 13, Ohio

Circle 52 on Reader-Service Card for more information

Step-Servo Drive Motor 309

Operating in conjunction with servocontroller and pulse source, this motor drive forms a device for autotransformer control independent of line frequency. Since step-servo drive operates without overshoot, system incorporating this bi-directional device does not require compensation of conventional servomechanisms. A604A autotransformer drive is designed to actuate General Radio W20 (50-420 cps) or M20 (350-1200 cps) "Variac" to



within 0.2 deg (compatible with the resolution of "Variac") at rates to 110 increments per second. Drive units for other variable autotransformers are available. Time for full-scale travel, stepping increments and number of autotransformers to be actuated by a single drive unit can be varied to suit customer requirements.

Automation Development Corp., 11824 W. Jefferson Blvd., Culver City, Calif.

Fasteners 310

A selection of more than 250 different types and sizes of hex cap screws, hex and hex screws, carriage bolts, lag screws and hex nuts may be obtained with plated finish. Fasteners are particularly desirable for applications requiring extra corrosion resistance. Zinc-plated units bring the total of standard fasteners stocked to more than 5700.

Standard Screw Co., 2701 Washington Blvd., Bellwood, Ill.

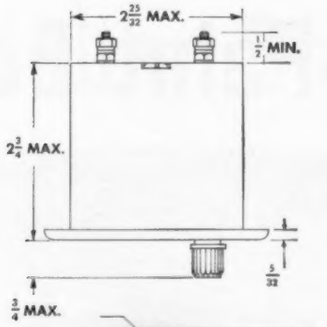
Differential 311

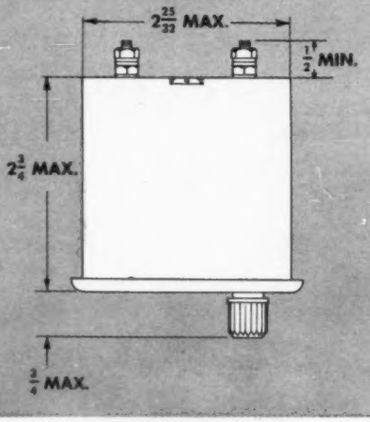
Extreme miniaturization of this differential has been accomplished through two-spider-gear design, featuring a ½-inch dia swing (clearance circle). Made of stainless steel, each unit employs 6 miniature ball bearings which conform to ABEC 7 tolerance requirements. Backlash is held to 8 minutes or less, break-away torque is 0.02 oz-in and balance is maintained at all times. Differential is obtained with either 0.0779- or 0.0935-inch dia shafts with overall lengths up to 3 inches.

Instru-Lec Corp. 520 Homestead Ave., Mt. Vernon, N. Y.

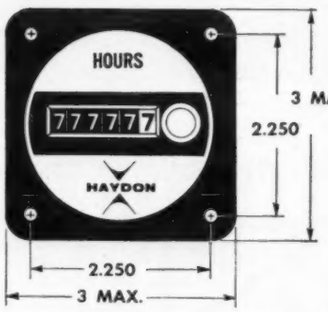
Circle 53 for Reader Service

New Series EN and ER Commercial ELAPSED TIME INDICATOR





Ideal for use on machine tools and other industrial or commercial machines and equipment where an accurate record of operating time is required – for efficient preventive maintenance procedures, for rental-basis operation, or for substantiation of manufacturers' guarantees. High-styled face registers hours and tenths and minutes and tenths up to 99,999.9 in big, easy-to-see figures on a direct-reading dial . . . and offers you highest quality and reliability, compactness and light weight at a lower price than comparable units. Available in resettable and non-resettable models with 3½" round bezel or 3" x 3" square bezel. Designed for operation at 120 or 240 vac, 50 or 60 cps. Low input: 5.0 watts at 60 cps, 3.4 watts at 50 cps. Write today for complete information and engineering data: Haydon Division of General Time Corporation, 3227 East Elm Street, Torrington, Conn.

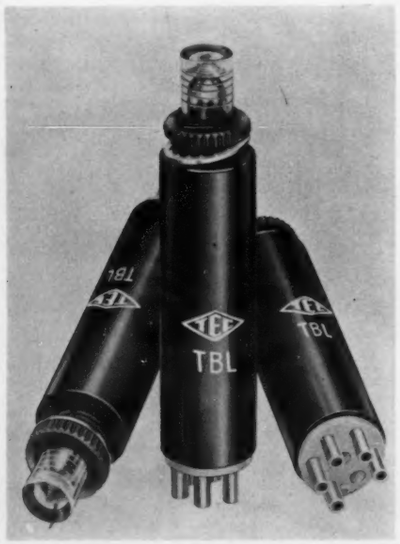


TIMING MOTORS
TIME AND TORQUE CONTROLS

HAYDON
DIVISION OF GENERAL TIME CORPORATION
3227 EAST ELM STREET
TORRINGTON, CONNECTICUT

Panel Lights 312

Miniature indicator lights combine a momentary-action push-button switch with transistor circuitry and complete neon indicator in a single unit. The neon lamp is transistor-controlled from small signals which eliminate need for high voltages in the logic circuits. The momentary-action switch offering A or B forms is an integral part of the series, saving panel space through simplified design and layout. The integral switch has gold-plated contacts with a life expectancy of over 500,000 operations at rated current.

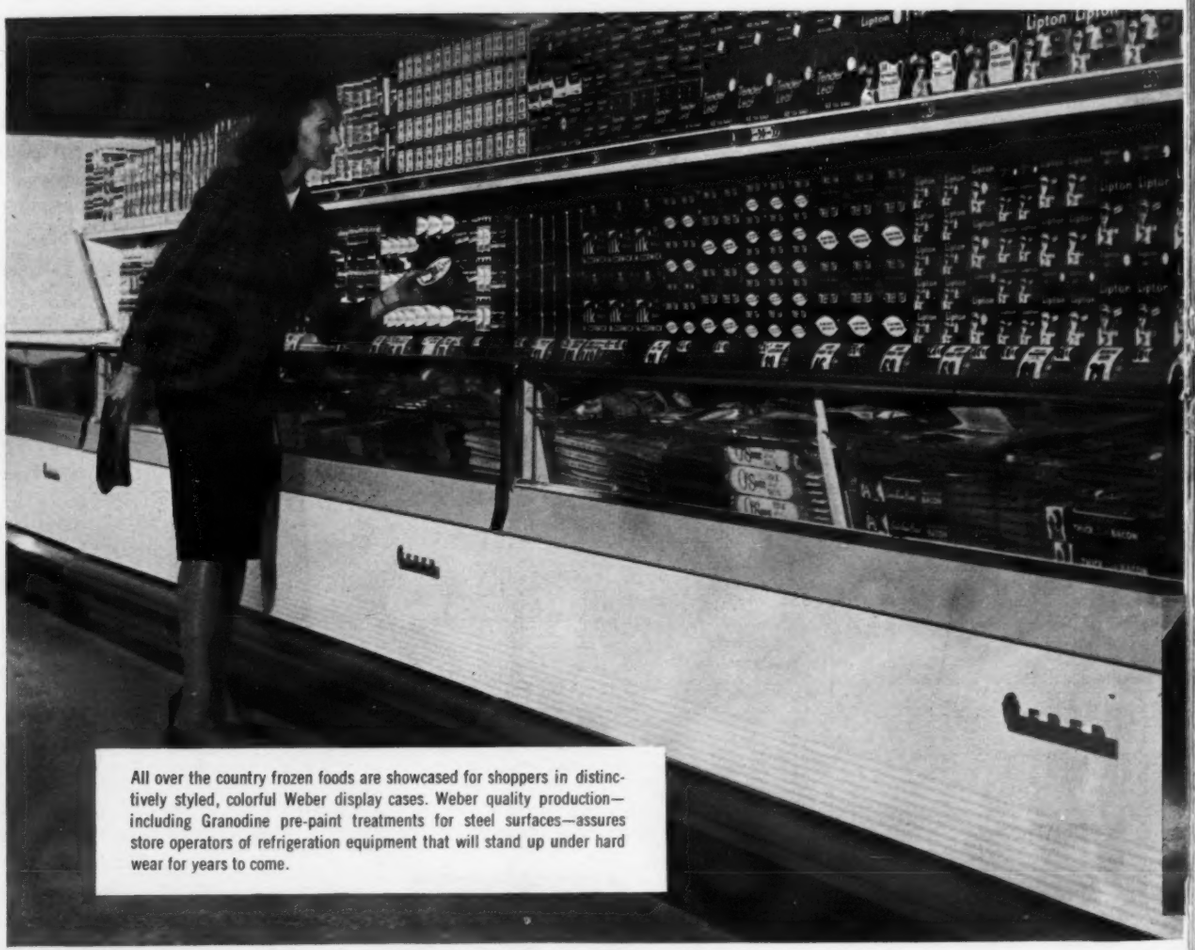


The unit operates within a temperature range of —40 to 65C at 95-percent humidity. Made of black anodized aluminum with matching nut (colors are also available), the body is designed to fit 1/16- to 1/8- and 9/64- to 3/16-inch panel thicknesses. Lights mount from rear with a single knurled nut and lock washer in a 3/8-inch hole on centers as close as 5/8 inch.

Transistor Electronics Corp., 3357 Republic Ave., Minneapolis 26, Minn.

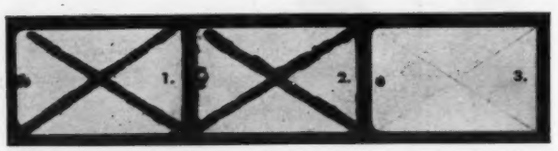
Take a lead from the leaders . . .

Three Amchem GRANODINE* Pre-Paint Economy and



All over the country frozen foods are showcased for shoppers in distinctively styled, colorful Weber display cases. Weber quality production—including Granodine pre-paint treatments for steel surfaces—assures store operators of refrigeration equipment that will stand up under hard wear for years to come.

GRANODINE—The obvious difference in pre-paint treatments



1. Solvent-cleaned—panels failed after 100 hours of accelerated testing.
2. Alkali-cleaned—panels failed after 100 hours of accelerated testing.
3. Granodine-treated—panels excellent after 336 hours of accelerated testing.

Phosphate Systems Provide Quality at Weber Showcase

One line alone achieves fuel savings of $9,000 per year; all three lines maintained by one operator for added labor savings!

Versatile Weber Showcase & Fixture Company, Inc., headquartered in Los Angeles, places a high premium on quality of its diversified line—supermarket display cases, coolers and fixtures, prefabricated partitions, flooring and lab equipment to mention a few.

High on Weber's quality requirement list is pre-paint treatment of steel products. And their first choice in zinc phosphate coatings is Amchem Granodine. Weber employs three separate Granodine phosphating lines to process hot- and cold-rolled steel.

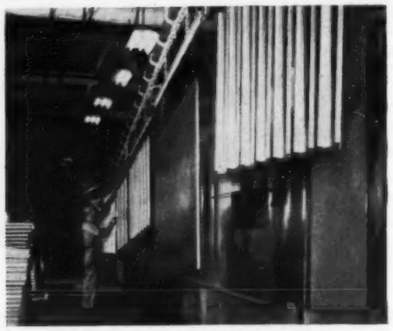
Prime advantage of Granodine, according to Weber management, is "*Granodine gives us a better piece of merchandise as far as eye-appeal, wearability and service life are concerned.*" Additional savings continue to be recorded in time and labor (a single operator adequately controls all three lines), and a substantial $9,000 annual fuel savings (via use of a Granodine cold zinc phosphate).

Take a lead from the leaders. If you fabricate steel products—if you want uniform quality in paint adhesion and corrosion resistance—if you want personalized technical service that adds savings in time, labor and cash to your operation, you want to investigate Granodine by Amchem. A call to your local Amchem Representative will furnish you facts and figures.

*Granodine is Amchem's registered trademark for its conversion coating chemical used to produce phosphate coatings on steel.

Weber's newest Granodine chemical line handles steel shelving, large cooler boxes suspended from conveyor.

On Weber's third Granodine chemical line—a cold zinc phosphate—Weber Wall Sheet enters the washer.



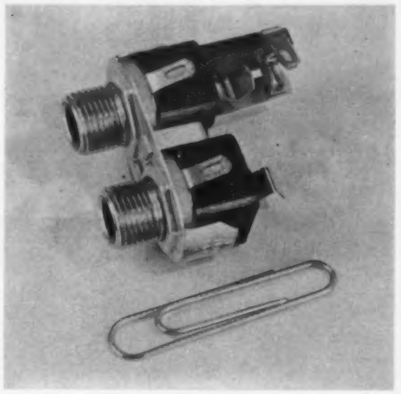
Exiting at right from cold Granodine washer, Weber Wall Sheets receive prime coat spraying.

AMCHEM **GRANODINE**

Amchem is a registered trademark of **AMCHEM PRODUCTS, INC.** (Formerly American Chemical Paint Co.)
AMBLER, PA. • Niles, Calif. • Detroit, Mich. • St. Joseph, Mo. • Windsor, Ont.

Circle 54 on Reader-Service Card for more information

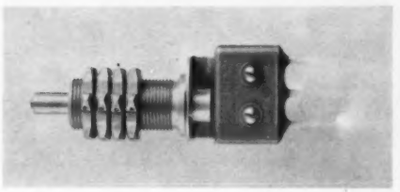
Twin Molded Phone Jacks 313



Construction of the J6-100 series twin jacks allows panel installation on 5/8-inch centers, eliminating usual tolerance difficulties. Mounting is by double-threaded bushings, 3/8-inch 32NEF-2. Overall module is approximately 1/4 of typical telephone types. More than 250 circuit combinations are obtainable. Most 2-conductor, 3-conductor, 2- and 3-conductor or cross-connected combinations of any circuits are possible. All contacts are gold-platinum-silver alloy and "cross-bar" welded.

Carter Parts Co., Dept. 19, 3401 Madison St., Skokie, Ill.

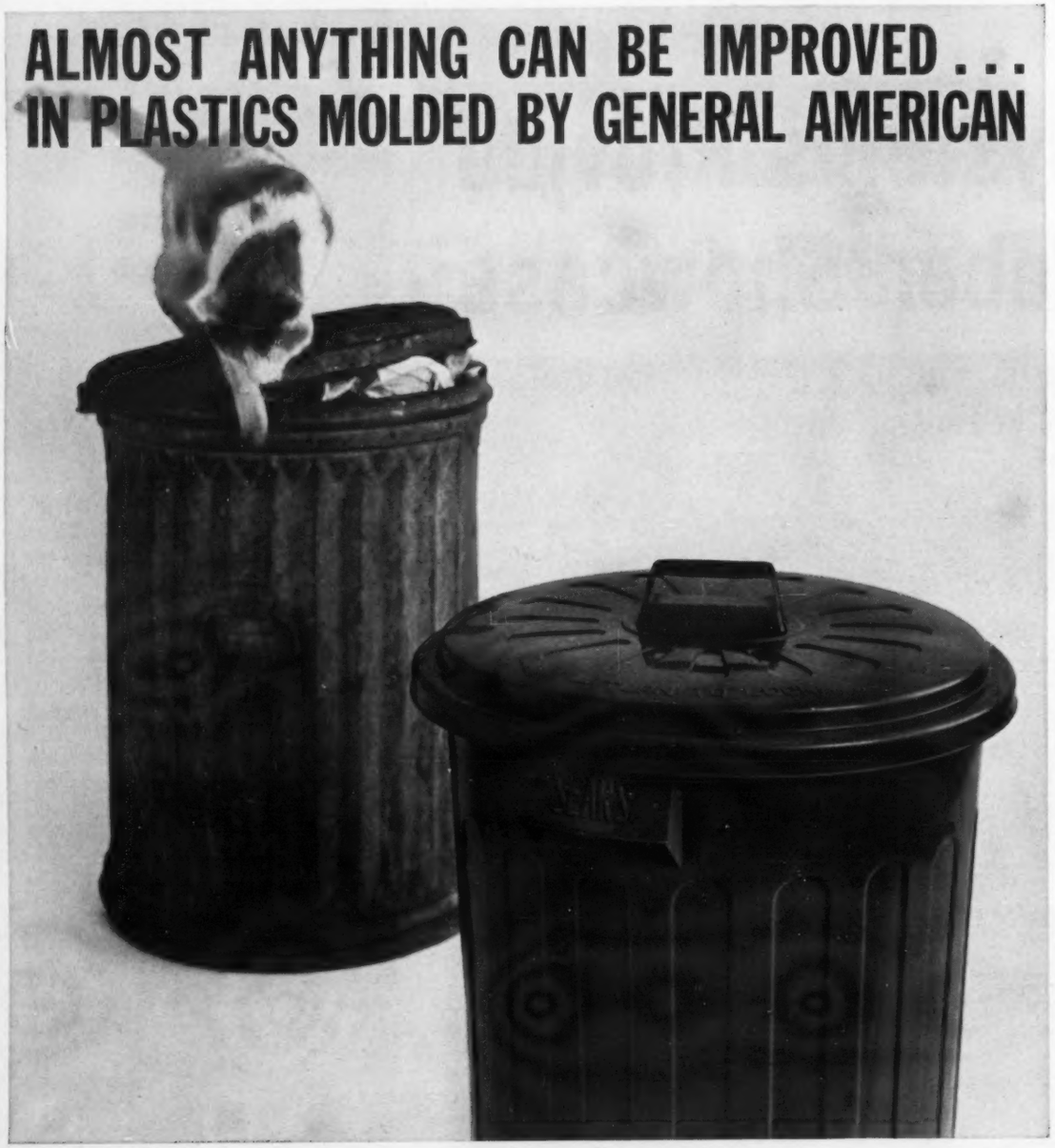
Heavy-Duty Push-Button Switch 314



Designed for use with environment-free switches, this complete unit with EF/136 switch has a single-pole, double-throw circitry and is rated at 5 amps, at 125/250v a-c; 2.5 amps, at 30v d-c inductive, or 4 amps, at 30v d-c resistive. The switch features 0.250 minimum overtravel, 4-oz minimum release force and movement differential of 0.004 maximum.

Controls Co. of America, Control Switch Div., 1420 Delmar Dr., Folcroft, Pa.

ALMOST ANYTHING CAN BE IMPROVED . . . IN PLASTICS MOLDED BY GENERAL AMERICAN



Sears Roebuck wanted dent-proof, rust-proof, quiet refuse containers. General American helped provide the answer.

The line of containers General American helped develop for Sears varies in size from 20-gallon trash cans to two-quart pails. All are colorful and easy-to-clean; won't rattle or dent.

Resourceful solutions to plastics problems are not at all exceptional at General American. Our engineers and plastics specialists are backed by the largest, most varied molding facilities in the world: compression presses to 2,000 tons . . . injection presses to 300 ounces . . . large extruding and vacuum-forming machines.

If you'd like to move profitably into plastics, you'll certainly find it pays to plan with General American.

PLASTICS DIVISION GENERAL AMERICAN TRADE MARK

Plastics Division

GENERAL AMERICAN TRANSPORTATION CORPORATION

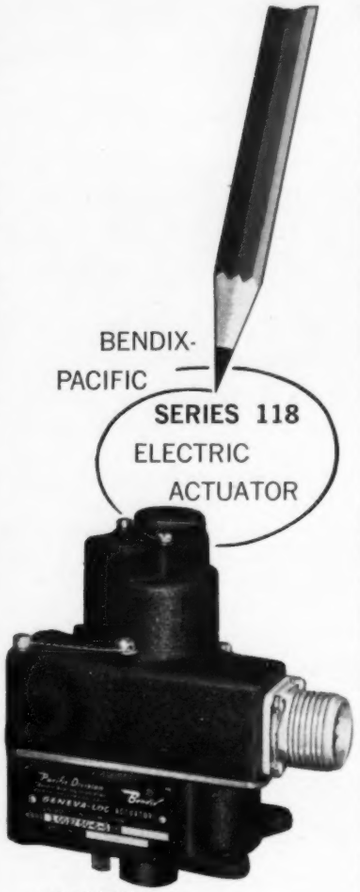
135 South La Salle Street • Chicago 3, Illinois • Offices in principal cities

Circle 55 on Reader-Service Card for more information

Adjustable Stop Switches 315

Type "CVS" instrument switches provide adjustable stop positions from 2 to 32 and 360-deg rotation. Construction provides flexibility and versatility in breadboards, circuit mock-ups and laboratory experimentation applications. Contacts, commutator rings and brush blades are of solid nickel-silver. Fine linen-base phenolic meets all requirements of MIL-P-15035, Type FBE supplied as standard deck material. Accurate indexing is accomplished by a combination of precision steel ball, heavy steel rotor and phosphor-bronze spring-tension plate. Hollow-bored stem terminal accommodates up to 18 AWG wire. Both shorting and non-shorting types are obtainable.

Aerovox Corp., Cinema Engineering Div., 1100 Chestnut St., Burbank, Calif.



PROVEN
IN AIRCRAFT AND
MISSILE CONTROL

of fuel, air, and cryogenic valves.
★ Features mechanical positioning, positive lock, unique torque characteristics.
★ Provides unusually high resistance to shock, acceleration and vibration. Weight 17 oz.

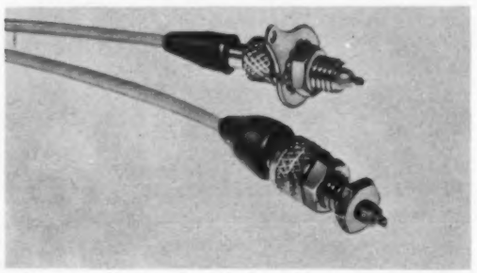
Contact Bendix-Pacific when your design requires—
ACTUATORS
Geneva-Loc • Conventional Rotary Linear • High-Response • Safe & Arm
TIMERS
Sequential Programming Repeat Cycle • Adjustable

Bendix-Pacific Division
NORTH HOLLYWOOD, CALIF.

THE Bendix CORPORATION

Circle 56 on Reader-Service Card

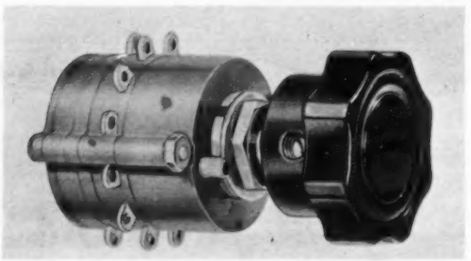
Microminiature Connectors 316



Screw-type coaxial connectors are manufactured in 50-, 70- and 93-ohm impedances, are universally interchangeable and are shock- and vibration-resistant. Standard types are straight plugs, angle plugs, receptacles, bulkhead jacks and jacks. Specifications include: minimum voltage breakdown test, 1500v a-c; contact resistance, 0.5 milliohm maximum; minimum cable pullout force, 15 lb (50 ohms); vibration, method 204, cond. B, per MIL-STD-202A; shock, method 202A per MIL-STD-202A; moisture resistance, method 106A per MIL-STD-202A; temperature range, —100 to 550F; quality control, per MIL-Q-5923C.

Electro-Physics Laboratories, Div. of Marshall Industries, 1900 Walker Ave., Monrovia, Calif.

1-Inch Dia Tap Switch 317



A molded miniature tap switch for military and commercial applications is available with as many as 8 decks. The unit has up to 12 positions per deck, single pole; 6 positions, double pole, and adjustable stops if a lower number of steps is required. Basic unit is 1¼ inches in dia, over the terminals and weighs 30 g. It has a rating of 1200v rms, 2000v d-c, 5 amps, (carrying) 115v, insulating resistance of 100 megohms minimum at 500v d-c and contact resistance of 6-10 milliohms. Life is 1.5-2 million revolutions within a temperature range of —65 to 80C. The tap switch meets requirements of MIL-S-3786 and applicable paragraphs of MIL-E-5272C.

Tech Laboratories, Inc., 42 Bergen & Edsell Blvds., Palisades Park, N. J.

PROJECT TESTED!

North American's X-15 rocket plane flies with K-seals aboard.

K Seals
have the finest "on the job" record of any static metal seal in the aircraft and missile field

Giant 35-incher for an Atomic Project.

K-Seal is a "project tested" name for the world's finest static metal seal . . . a name specified on the nation's toughest missile and rocket projects. Users under NASA, Air Force and Navy Development and Production contracts include: Convair (Atlas ICBM), Rocketdyne, General Atomics, Sundstrand, Bendix, North American and Lockheed Missile Systems.

Tiny K-Mini-Seals can seal a needlepoint.

Q—How big is a K-Seal?
A—As big as the job requires.

Available in various metals and coatings, including the *new Harrison K-6 metal-alloy coating* which has set new test standards for high and low temperatures, use with exotic fluids and gases, radio-active applications and extended storage.

Harrison **Manufacturing Co.**
2908 N. Naomi Street, Burbank, Calif./The World's Most Experienced Sealmaker

Richard H. Williams, Pres.
Harrison Mfg. Co.
2908 N. Naomi St.
Burbank, Calif.

Please send me free Brochures on:
☐ Flange type metal seals
☐ Metal Seals for AND-10500 Bosses
☐ New K-6 Alloy Coating for Metal Seals

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Title _____
Company _____
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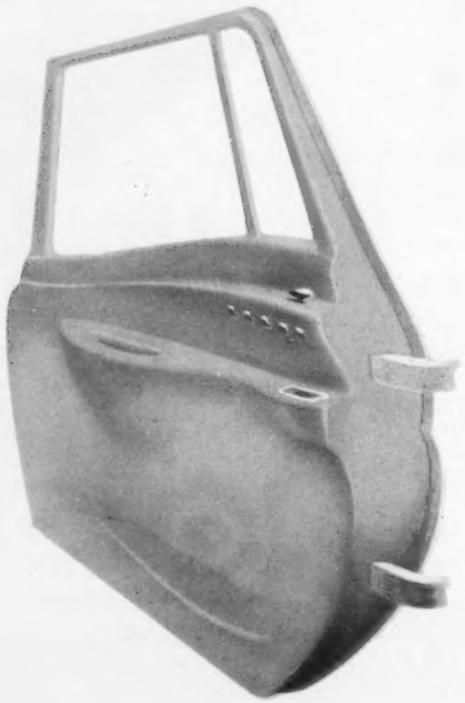
City _____ Zone ____ State ____

Representatives in:
San Jose
Seattle
Phoenix
Huntsville
San Diego

Represented Nationally by
The Harold E. Webb Co., 1307 N. San Fernando Rd., Burbank, California

Circle 57 on Reader-Service Card for more information

Naugatuck KRALASTIC
THE ORIGINAL ABS RESIN



KRALASTIC...the practical material for door liners...

- one piece, complete with garnish molding, arm rest, ash tray receptacle...
- greatly simplifies installation and later door mechanism servicing...
- weighs very little, yet is close to indestructible...
- will never wear out, never stain, never rip...
- can be given any lasting, integral color, any desired surface texture...
- insulates against both sound and heat...
- offers important sales appeal...
- provides true manufacturing economy.

Seldom has the designer-engineer had such a versatile and thoroughly practical material with which to work. The original ABS resin that combines hardness, toughness, stability, formability, and attractiveness as no other material, KRALASTIC® has proved its virtues in hundreds of products, from hair combs to professional football helmets, from portable radios to underground pipe.

Prove it to yourself. You'll end up with a better product.

For further information on how KRALASTIC can help you, write: 901 New Center Building, Detroit 2, Michigan. TR 4-3500.

US RUBBER

United States Rubber
NAUGATUCK CHEMICAL DIVISION
DEPT. 345K ELM STREET, NAUGATUCK, CONNECTICUT

KRALASTIC ABS RESINS • MARVINOL VINYLS • VIBRIN POLYESTERS

DIST. OFFICES: Akron · Boston · Chicago · Gastonia · Los Angeles · Memphis · New York · Philadelphia · CANADA: Naugatuck Chemicals · Elmira, Ont. · Cable: Rubexport, N.Y.

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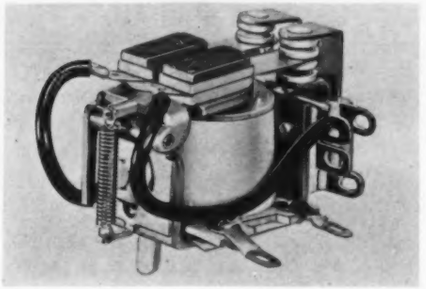
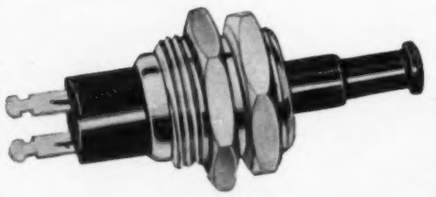
15-Amp Power Relay 318



Stability of adjustment through long service life is featured in this small a-c/d-c power relay. A pin-type armature hinge, with centerless ground stainless-steel pin and precision reamed bearing surfaces, provides adjustment stability with low friction and positive contact effectiveness. Fiberglass melamine insulation, independently riveted coil terminals and riveted contacts with built-in contact wipe are design features included. Furnished with DPDT or SPDT, 15-amp, heavy-duty, silver-alloy contacts for a-c and d-c operation, unit is available with DPDT 15-amp contacts for 6, 12, 24 and 115v a-c and d-c.

Magnecraft Electric Co., 3350P W. Grand Ave., Chicago 51, Ill.

Push-Pull Switch 319



The No. 30-16 switch unit requires only ½-inch mounting hole and measures 1.492 inches in length. Life expectancy is over 100,000 cycles. Switch has a "positive-feel" detent action with an audible click. Push-on, pull-off action, SPST, normally open with butt contact, the unit is rated at 1 amp, 115v a-c resistive circuit, at contact resistance of 0.010 ohm. Voltage breakdown, terminal-to-terminal and terminal-to-housing, is 1500v a-c. Base is molded phenolic per MIL-M-14, type CFG. Button is molded phenolic, type CMG or CFG.

Grayhill, Inc., 561 Hillgrove Ave., LaGrange, Ill.

Circle 59 on Reader-Service Card

ZE10A—with high welded joint strength—is ideal for making light, strong containers like the Tote Bin (right), built by Tote Systems, Inc., Beatrice, Neb., a subsidiary of Hoover Ball and Bearing Co.

NEW DOW MAGNESIUM ALLOY ZE10A . . .

high welded joint strength and no stress relief!

New Dow magnesium alloy ZE10A needs no post-welding stress relief. This strong sheet alloy is tailor-made for fabricating containers, truck bodies and other large structures. And it's ideal for field repair operations where stress relief can be a real problem.

ZE10A also offers the advantage of very high welded joint strength, a matter of importance in butt welding. The result is strong, stiff, welded containers which are extremely light in weight . . . with greater capacity, pound-for-pound, than containers made from any other metal! And ZE10A provides maximum dent resistance.

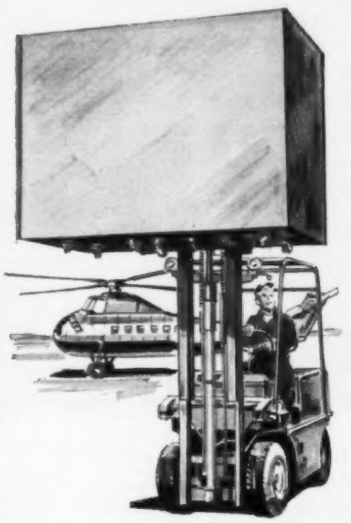
When welding ZE10A magnesium sheet to extrusions, use Dow magnesium extrusion alloy ZK21A. *Neither* alloy requires stress relief after welding. For further information and data on Dow magnesium alloys, write THE DOW METAL PRODUCTS COMPANY, Midland, Michigan, Merchandising Department 1112AV3-27.

DOW

THE DOW METAL PRODUCTS COMPANY
Division of The Dow Chemical Company

DOW

HOW MAGNESIUM NO-RIB DESIGN CUTS CONTAINER COSTS AND WEIGHT



Cargo containers can be made both strong and light . . . and at less cost . . . with magnesium no-rib design. Fabricated from stiff sheets of lightweight magnesium, container walls need no stiffening ribs or supports.

No-rib design eliminates costly, time-consuming installation of ribs and fasteners . . . provides strong, dent-resistant walls that are smooth inside and out . . . produces economical containers that, pound-for-pound, have greater cubic capacity than ribbed containers of any other metal.

Dow magnesium sheet alloy ZE10A is ideal for no-rib construction. It provides high welded-joint strength and *needs no stress relief* after welding. For equipment handling and cargo containers, storage bins, vehicle bodies, magnesium no-rib construction offers maximum strength at lightest weight . . . and savings in construction time and costs!

DOW

THE DOW METAL PRODUCTS COMPANY
Division of The Dow Chemical Company
Midland, Michigan

Pressure-Sensitive Lettering 320

"Instant Lettering" consists of 10- by 15-inch plastic sheets on which is processed a font of letters in opaque black or white. Lettering may be used on roughs or finished art, posters, displays, signs, graphs, charts, showcards and other applications. It transfers cleanly to paper, cardboard, wood, glass, metal and film. Each letter is defined sharply, is of high reproduction quality and is arranged on font system, giving more of the letters in most frequent use. Working samples are available.

Arthur Brown & Brothers, Inc., 2 West 46th St., New York 36, N. Y.

Flat Ribbon Cable 321

Multi-conductor flat ribbon cable is designed for ease of handling, full visibility of color code, control of interconductor capacitance and uniformity between one length of cable and the next. Space factor is improved at the same time that better heat dissipation is obtained. Insulation is PVC plastic. Gages run from No. 10 AWG to No. 30 with almost any number of conductors. Shielded leads, coax or thermocouples can be included.

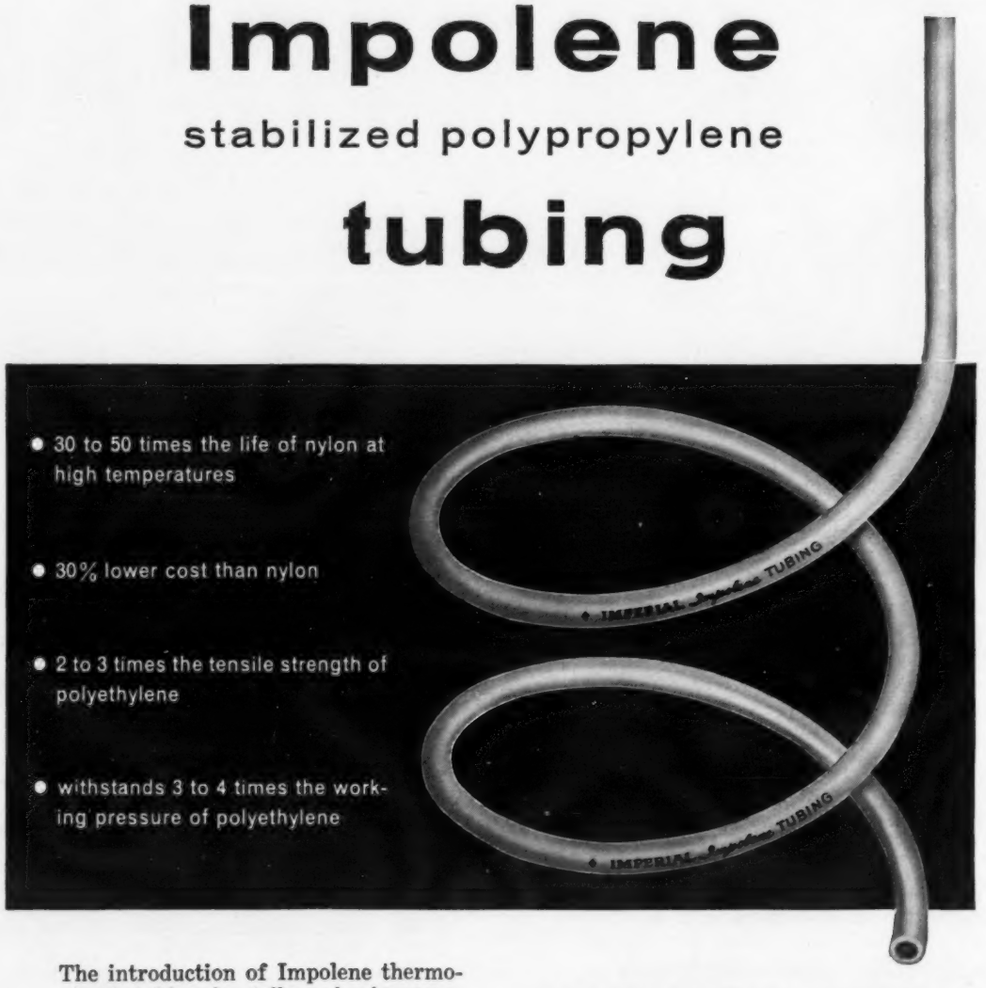
Spectra-Strip Wire & Cable Corp., P. O. Box 415, Garden Grove, Calif.

new

Impolene

stabilized polypropylene

tubing


• 30 to 50 times the life of nylon at high temperatures
• 30% lower cost than nylon
• 2 to 3 times the tensile strength of polyethylene
• withstands 3 to 4 times the working pressure of polyethylene
IMPERIAL Impolene TUBING
IMPERIAL Impolene TUBING

The introduction of Impolene thermoplastic tubing foretells major improvements in the transmission of air and fluids. This Imperial-Eastman stabilized polypropylene tubing now has many proved uses. Many more await it. What's yours? For complete data, write for Impolene Bulletin No. 301.

IMPOLENE

IMPERIAL EASTMAN

Imperial-Eastman Corporation General Offices: 6300 West Howard Street, Chicago 48, Illinois

In Canada: Imperial-Eastman Corporation (Canada) Ltd., P.O. Box 645, Barrie, Ontario

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new

Impolene

with *new* advantages, many *new* uses

High tensile strength. Highest strength-to-weight ratio of all thermoplastic tubing. Working pressures compare favorably with nylon—are 3 to 4 times greater than polyethylene.

Excellent corrosion-resistance. Resists concentrated hydrochloric acid up to the boiling point. Withstands saline solutions at temperatures over 212° F. Shows no detrimental effects in boiling sulfuric acid.

Wide temperature range. Can be used up to 300° F. Has 30 to 50 times the life of nylon at elevated temperatures. Remains flexible at —100° F.

Good abrasion-resistance. High surface hardness gives it much better abrasion-resistance than most thermoplastics.

Odorless . . . tasteless . . . resists sunlight. Approved by the FDA and NSF for food and drinking water applications.

Use Impolene tubing for air lines, control panels, instrumentation and lubrication systems, processing and construction machinery—many other uses.

Available in 500' to 1000' spools in O.D. from ⅛" to ⅜". Other sizes available on special order.

Poly-Flo Fittings—designed for use with all plastic tubing, yet usable with soft metal tubing. Withstand pressures beyond burst strength of tubing. Available in a complete range of sizes and styles.

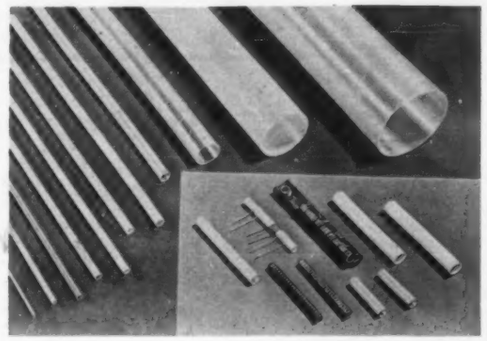
Now Imperial-Eastman meets all your requirements for hydraulic-pneumatic-flow system components: tube fittings, valves, couplings, flexible and rigid hydraulic and pneumatic lines, thermoplastic tubing, tubing tools.

TUBING

IMPERIAL — EASTMAN

Circle 61 on Reader-Service Card

'Mylar' Tubing 322



Tubing is now available in a wide range of ID's from 0.040 to 8 inches. Wall thicknesses range from 0.001 to 0.050 inch in relationship to ID. Tubes have a high dielectric strength of 2500v/mil minimum, with a continuous heat resistance of 300F, and are rated Class B (130C). They are impervious to common solvents, alcohol, naphtha, tuluol and similar chemicals, as well as resistant to corrosion and fungus. Tubing is offered in threaded forms for such purposes as iron core coils. It can be supplied with a polyester coating which protects against possible breakthrough caused by threading.

Resinite Corp., Dept. DN-1, 6984 N. Central Park Ave., Chicago 45, Ill.

Gasket Compound 323

An easy-to-apply gasket compound is available for leakproofing gasketed assemblies. It also can be used effectively to repair broken gaskets, for building up damaged, misaligned or warped flanged surfaces, or as a gasket substitute where surfaces permit. "Seal-Last" can be used for a wide variety of industrial fluids and gas services, including water, steam, oil or water-based hydraulic fluids, LP and natural gases, petroleum products, mild corrosives and many chemicals. Temperature range is from —65 to 400F, pressures to 5000 psi. Two types are offered: a soft-set variety for connections that must be disassembled periodically and a hard-set variety for permanent installations. The hard-set type dries quickly and withstands vibration, as well as contraction and expansion caused by temperature change. Both types come in 1½-oz, 3-oz and 11-oz tubes. The two larger-sized tubes are supplied with a handy applicator cap for spreading the compound easily, quickly and neatly.

Crane Packing Co., Dept. DN-1, 6400 Oakton St., Morton Grove, Ill.

R. C. SPIRO MFG. CORP. states: The use of Ferro-Tic in our progressive stamping dies enables us now to run 1,000,000 clips without resharpening. Previously, resharpening was necessary after only 100,000 pieces.

FERRO-TIC combines the fabricating advantages of steel with the wear-resistance of carbide. In the annealed, completely dense state, **FERRO-TIC** can be machined with high-speed tools on conventional tool room equipment; thus, the need for costly diamond grinding is eliminated. Once hardened, by oil quenching from 1750°F, **FERRO-TIC** is extremely hard and wear-resistant. **FERRO-TIC** stock blanks can be fabricated into long-wearing components, using available tools and skill without delay! **FERRO-TIC** is ideal for: Blanking, Lamination, Deep Drawing and Heading Dies, Arbors, Core Rods, Wear Parts, etc. **FERRO-TIC** can be turned, drilled, milled, sawed, tapped . . .

Sintercast

AGENTS THROUGHOUT THE U. S. A.
WRITE FOR ILLUSTRATED BULLETIN D-3

Division of **CHROMALLOY CORPORATION**
169 Western Highway, West Nyack, N. Y. • ELmwood 8-5900

CHROMALLOY DIVISION, WEST NYACK, NEW YORK
CHROMIZING CORPORATION, LOS ANGELES, CALIF.
PROPELLEX CHEMICAL DIVISION, EDWARDSVILLE, ILL.
ELYRIA FOUNDRY DIVISION, ELYRIA, OHIO

*Reg. U.S. Trade Mark

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PROBLEMS SOLUTIONS

. . . a two-way street

Do you have a design problem that needs an outside viewpoint?

Try **IDEA MART** . . . for Effective Communications.

Let other DESIGN NEWS readers help you on the 'tough ones'. Briefly outline your problem and send it to **IDEA MART**—DESIGN NEWS, 20 N. Wacker Drive, Chicago 6, Ill., Attn. E. R. Cunningham, Editor.

Acetate-Film Electrical Tape 324

An economical electrical holding tape features acetate-film insulation, glass filament strength and a solvent-resistant, thermosetting adhesive. No. X-1131 is designed to replace cotton cloth and paper tapes in many holding applications. The material combines electrical strength and purity of 1.5-mil, acetate-film backing with physical strength of glass filaments. Adhesive is not affected by solvents such as VM&P naphtha or Xylol. Average thermosetting cure cycle is 2 hr at 130C. Tape may be used on fine-wire applications and will not cause corrosion under prolonged exposure to humidity and electrical stress. The 7-mil tape has an electric strength of 5000v, tensile strength of 130 lb-in and an electrolytic corrosion factor of 1.

Minnesota Mining & Mfg. Co., 900 Bush Ave., St. Paul 6, Minn.

Magnet Wire 325

Film-coated with ML polymer, magnet wire is rated for Class H temperature service (180C) or better. Cut-through resistance is in excess of 400C, which is significantly higher than existing conventional types. Thermoplastic flow ratings are equally high. Solvent resistance is good, including complete resistance to synthetic transformer oils and mineral oils. Wire has good dielectric strength wet or dry, 3400v per mil dry, 1900v per mil wet. Heat shock and mandrel tests show excellent results. Wire is available in sizes from AWG 20 through 44.

Tensolite Insulated Wire Co., Inc., W. Main St., Tarrytown, N. Y.

Find out today how REVERE TUBE-IN-STRIP can help you save money . . . improve product quality

Shown on these pages are three of the many, many ways Revere Tube-In-Strip is used. Such money-saving performances are made possible by the fact that Revere Tube-In-Strip is a solid piece of flat sheet or strip metal with built-in passages that may be inflated, by pressure, into tubes. Thus the tubes become an integral part of the metal.

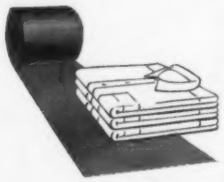
Expanding in the open, the tubes are round; by expanding into dies, the tubes can be rectangular, fluted, half-round, hexagonal, etc.

Revere Tube-In-Strip saves on first cost, and in fabrication. New and improved designs are made possible. The web between the tubes conducts heat faster. The vastly increased structural strength means you can use lighter gauges, saving in weight and price.

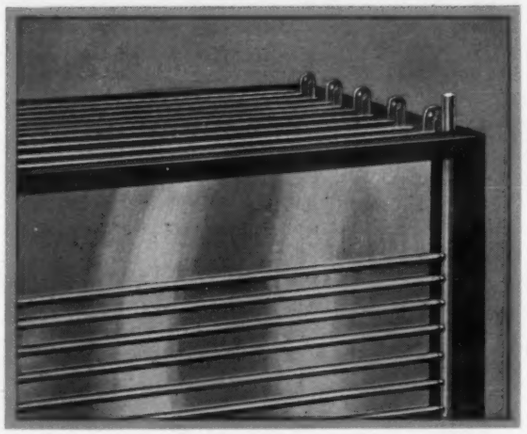
Revere Tube-In-Strip is available in Copper, Copper-base alloys, and Aluminum alloys. The Revere Technical Advisory Service and the Research and Development Department will gladly collaborate with you in taking full advantage of this marvelous new material.

REVERE
COPPER AND BRASS INCORPORATED
Founded by Paul Revere in 1801
Executive Offices: 230 Park Avenue, New York 17, N. Y.
Sales Offices in Principal Cities. Mills: Rome, N. Y.; Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles, Riverside and Santa Ana, Calif.; New Bedford and Plymouth, Mass.; Brooklyn, N. Y.; Newport, Ark.; Ft. Calhoun, Neb.
Distributors Everywhere

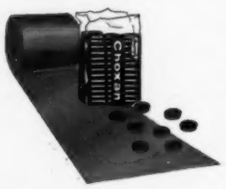
*SAVES $1,485.37 in 4-month period as Heat Reclaimer . . .



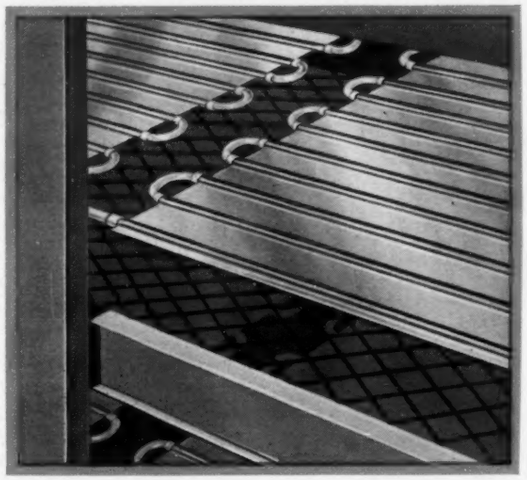
This heat reclaimer, made by KILLEBREW ENGINEERING CORPORATION, St. Louis, Mo., consists of a battery of 30 panels, with 3 panels of Revere Copper Tube-In-Strip, riveted together, measuring 48" x 82" overall. Water used for washing is heated as it flows through the tubes. The unit, installed in the 78-year-old industrial laundry operated by CHAS. TODD OVERALL CLEANING CO., saved, in a 4-month period, $1,485.37, with the laundry operating on a one-shift basis and at the desired water temperature. During that time, 200,000 more pounds of laundry were washed than in the previous 4 months at a $100.00 saving in steam cost. Prior to that time, due to a limit on the amount of steam that could be purchased, the laundry had to use a lower water temperature and operate on a two-shift basis.



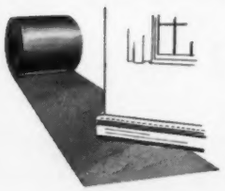
*SAVES UP TO 30% for biscuit maker, improves product quality . . .



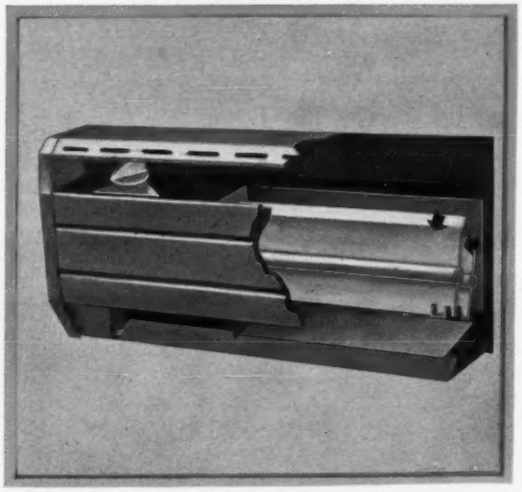
At the BURRY BISCUIT CORPORATION, Elizabeth, N. J. about 7,000,000 lbs. of product is turned out in 20 days, a large portion of which is chocolate coated and processed through the Reflectotherm system of reflective radiant cooling. This unit consists of a 108'-long, fully enclosed tunnel. On top and bottom of the tunnel are nine 8' sections of Revere Copper Tube-In-Strip through which is pumped a cooling medium at 8 to 12 degrees F. This results in the chocolate, through radiation, being set properly within 4¾ to 5 minutes. Also included in this installation is a Reflectotherm drying unit, made of Revere Tube-In-Strip, by which 250 cubic feet of super-dry air per minute, at a temperature below zero, is forced between the plates. Burry Biscuit, one of the country's leading independent bakers, reports a tremendous improvement in product quality with an increase in production running as high as 30%.



*SAVES MANUFACTURING COSTS increases efficiency of Electric Baseboard Heaters . . .

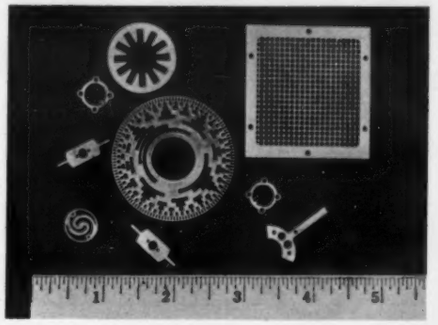


MEIER ELECTRIC, Indianapolis, Indiana, chose Revere Aluminum Tube-In-Strip for their line of electric baseboard heaters after numerous materials and designs were tested by their Engineering Department. The rigid design objectives were: (1)—Encase Heaters in a non-corrosive material, (2)—Use Tandem 500 plug-in case for 500, 750 and 1000 watt units while maintaining lower case temperatures at all wattages, thus eliminating duplication of dealers' stocks, (3)—Include inbuilt thermostats, junction boxes and thermal cutout in the unit to simplify construction, save space and cut manufacturing costs, (4)—Retain the quietness, lack of wall streaking and safe, low case temperatures originally available only in the 500 watt Tandem. All of these objectives were ultimately accomplished by using Revere Aluminum Tube-In-Strip to encase their heating element (see arrows).



Circle 63 on Reader-Service Card for more information

Photo-Etched Precision Parts 326



Custom-made precision parts feature extremely close tolerances, as close as 0.0002 inch, through chemical etching. Manufacturers have found it unnecessary to do any deburring on precision parts which can be furnished in Hy-Mu 80 and Hy-Mu 800, stainless, beryllium copper, phosphor bronze, silicon, nickel silver and silver, as well as the more conventional metals such as copper, brass, bronze, spring steels, nickel alloys and others.

Komak, Inc., 2632 W. Cumberland St., Philadelphia 32, Pa.

Tracing Vellum 327

"Ozatrace" may be used as a highly durable tracing paper for engineering, tracing, architectural drawings, map reproductions and for type-on masters for whiteprint, letterpress or offset reproduction. It is useful for general industry, consulting engineers, aerial survey companies, oil companies, utilities and government agencies. The surface will accept drawing ink without skipping, feathering or spreading. Pencil lines may be erased from one spot at least 10 times without damage to drafting surface; ink lines may be erased at least 3 times. High tear strength is reportedly the most important feature in a tracing paper; this material exceeds the requirements of federal specifications for transparentized permanent tracing papers. Paper also exceeds federal specification (UU-P-00561e) requirements for retention of strength and transparency after forced aging and for lack of transparentizer leakage. The tracing vellum is supplied in 16-lb weight, in 30-, 36- and 42-inch rolls, and in all cut sheet sizes.

Ozalid Div. of General Aniline & Film Corp., 50 Corliss Lane, Johnson City, N. Y.

Is your materials-handling equipment years ahead of your engineering design equipment?

Save all the money you can with the latest materials-handling devices—but don't overlook your drafting department, either! Professional draftsmen really deserve the latest equipment—it's just *good business* for you to see that they have it.

Your draftsmen, your productivity, deserve new Hamilton space- and time-saving equipment from Dietzgen

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HAMILTON CL-100 TABLE Entirely new, canted-leg styling assures stability without side crossrails. Strata-Core board, with green linoleum surface, both sides steel edged; tilts 0° to 40°. Fully adjustable recessed footrest; steel reference, tool, and catalog drawers. Other fine features, superb styling in light Sahara Tan, satin-chrome hardware.

Hamilton L-Contour Table
Prestige-assured, individualized work area providing complete board adjustment plus extra storage and reference area.

Hamilton Unit System Files
Provide full protection, accessibility, and classification for all materials to be filed. Occupy minimum floor space.

Hamilton Auto-Shift Table
Built-in mechanism adjusts board to individual height and slope requirements, provides full accessibility, reduces errors.

Drafting-Printmaking Booklet reports new techniques for solving engineering and production problems

This new 36 page booklet describes a wide variety of engineering and production problems that have been solved with advance techniques in drafting and printmaking pioneered by Dietzgen. The concise, problem-solution approach suggests ways in which you may improve the efficiency within your engineering department or eliminate production bottlenecks. Write today on your company letterhead for the Mechanics of Modern Miracles. Ask for Publication SPD2-A10. Eugene Dietzgen Co., Chicago 14, Illinois

DIETZGEN

EVERYTHING FOR DRAFTING
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PRINCIPAL OFFICES: CHICAGO · SAN FRANCISCO
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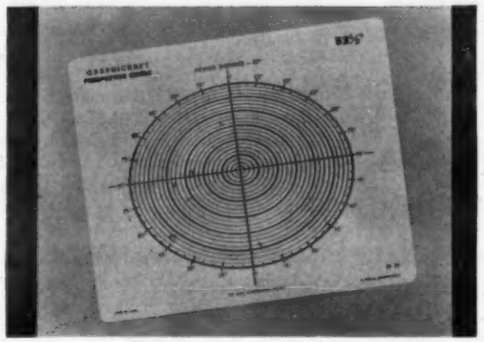
Circle 64 on Reader-Service Card for more information

Perspective Circle Drawing Aids 328



A set of 27 underlay guides, showing circles from ¼ to 6 inches in dia at viewing angles from 5 to 70 deg with 2½-deg steps, gives a gradual visual transition of the circle as it moves from one area to another in perspective drawing. Precisely accurate at a viewing distance of 30 inches, guides are compatible with any perspective grid or drawing of similar viewing distance. The 5-deg calibrations also enable guides to be used as perspective protractors. Drawing aids are made of heavy moistureproof bristol for good durability.

Graphicraft, P. O. Box 509, Westport, Conn.

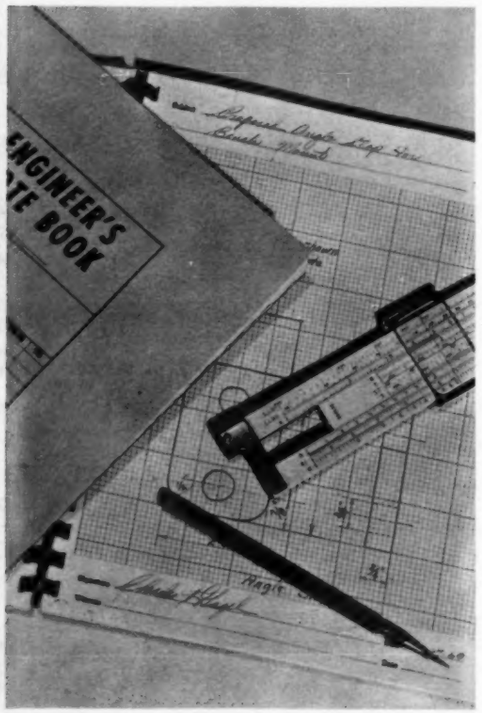
Check Protector 329

"The Registrar" enables one to write a check with the pen and "tamper-proof" it with a roller device called "Rolotrac" on the other end. This is done by placing a base plate, which has a wide track of precision protrusions, under the check. The "Rolotrac" is rolled on surface of check across section to be protected. Base plate is made of lightweight plastic and is carried in checkbook itself. Entire unit weighs about 1 oz.

Hamilton-Pax, Inc., 3745 N. Kedzie Ave., Chicago 18, Ill.

Engineer's Notebook 330

Authenticated records from idea conception to completion in original form provide background for patentable material. With the Engineer's Notebook, all information is contained in one package for easy, compact filing and cross indexing. This notebook furnishes the ability to reproduce original work without additional effort, through the use of tear-out tracing sheets behind each graph sheet, thereby removing possibility of error in copy work. This method does not disturb original work. There are removable data sheets



in back of notebook for recording measurements, handy reference data used most often by engineers and scientists, and pages for indexing contents of book. Plastic-bound, the book consists of 50 graph sheets, 50 tracing sheets, 10 data sheets and 3 index pages. Size is 8½ by 11 inches.

Tech-Form Co., 114 S. First St., Louisville 2, Ky.

New Chassis-Trak Utility Slides Support 15 Times Their Own Weight

Three Models— TILT, TILT-DETENT, and NON-TILT

With the introduction of the C-230 Utility Slide, Chassis-Trak can now offer a complete line of electronic cabinet slides in a capacity range from 50 to 275 lbs. The new Utility Slide can be used in any standard rack and in any type of mobile or stationary installation where the chassis load does not exceed 100 lbs.

Chassis-Trak's famous "pencil thin" design is an outstanding advantage of the new C-230. A pair of these fully-extendable slides take up only .620" of usable chassis space —far less than any other slides of equal capacity.

Made of hard, cold-rolled steel, each slide is cadmium plated and then coated with Poxylube 75. This is a bonded film of molybdenum disulfide which provides permanent dry lubrication and protects the metal against solvents, acids and corrosion.

Chassis-Trak C-230 slides are available in seven lengths—12" to 24"—and in a choice of tilt, tilt-detent or non-tilt models. The detent model locks in three positions —90° up, horizontal, and 90° down —for convenience in servicing both tube and circuitry sections.

For complete details and specifications on the new C-230 Utility Slide, write for Engineering Data Sheet No. 1600.

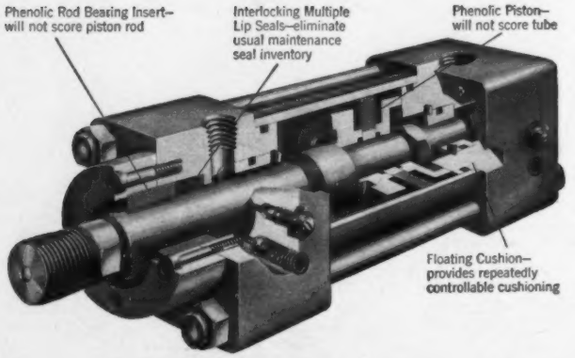
CHASSIS-TRAK, INC. • 525 SOUTH WEBSTER AVE. • INDIANAPOLIS 19, INDIANA

Circle 65 on Reader-Service Card for more information

Fluid Circuitry News from Westinghouse

Industrial Product Division expands line

The Petch line of high quality air and hydraulic cylinders is now part of the line of Westinghouse Fluid Circuitry components. This acquisition makes it possible for us to offer industry the *most complete line* of air and hydraulic components for control systems to automate industrial production operations.


Phenolic Rod Bearing Insert–will not score piston rod
Interlocking Multiple Lip Seals–eliminate usual maintenance seal inventory
Phenolic Piston–will not score tube
Floating Cushion–provides repeatedly controllable cushioning

The Petch line of rugged, precision made cylinders include the following models:

Air & Low Pressure Hydraulic Cylinders

150 psi Air 500 psi Hydraulic
1″ to 10″ Bores
10 Standard Mountings

High Pressure Hydraulic Cylinders

1½″ to 6″ bores—2000 psi
8″ to 10″ bores—3000 psi
10 Standard Mountings

All Petch Cylinders conform to J. I. C. Standards.

FLUID CIRCUITRY... FOR TROUBLE-FREE AUTOMATION

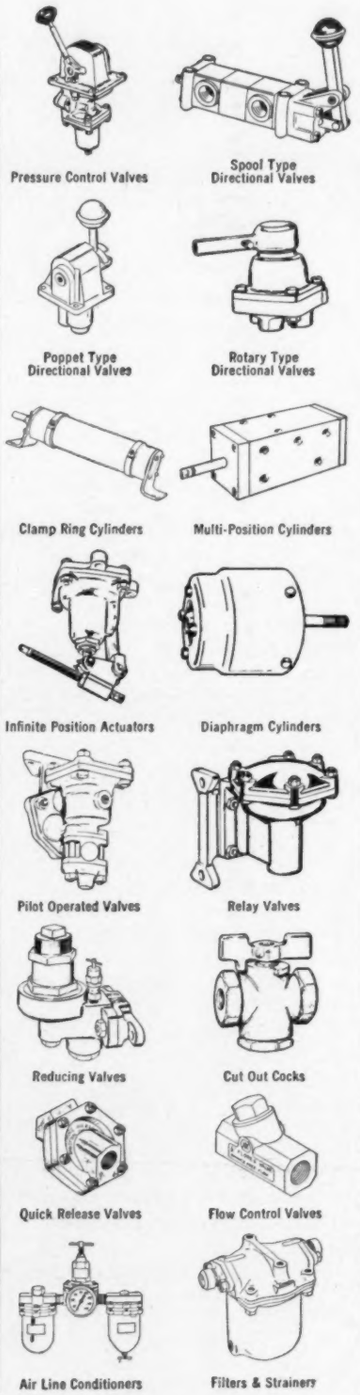
Fluid Circuitry is the application of fluid control systems to industrial production operations.

Fluid Circuits are economical, safe and precise. They are used to solve the most vigorous and complex control problems.

They contain reliable products to boost your production and cut your production costs.

For more information on Petch Cylinders and Fluid Circuitry ask for catalog A3-56.00.

See the Yellow Pages under Cylinders for the Name of Your Local Distributor, or refer to Sweet's Catalog, Product Design File.

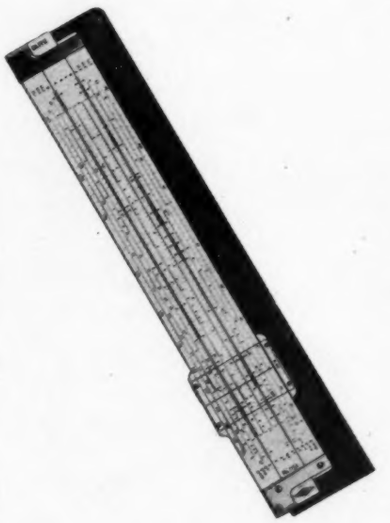


WESTINGHOUSE AIR BRAKE COMPANY
INDUSTRIAL PRODUCTS DIVISION, WILMERDING, PENNSYLVANIA

Circle 66 on Reader-Service Card for more information

Engineering Slide Rule 331

Complicated problems involving fractional or non-integral powers, and roots of integral or non-integral quantities, are solved easily and accurately with this calculator's extended range of Log Log scales. With these scales, evaluating expressions and arrangement of mathematical problems are solved as simply as multiplication. "Machine-divided" graduations allow quick and easy reading with exacting accuracy continually guaranteed. Color-coded scales and reference symbols



simplify and speed coordination scale readings. Made of durable laminated bamboo, the "Elite" is complete with ivory white plastic facing for improved readability. Slide rule is available in three popular 10-inch models, each designed specifically for mechanical engineer, advanced electronics engineer and scientist.

Alvin & Co., Inc., 611 Palisado Ave., Windsor, Conn.

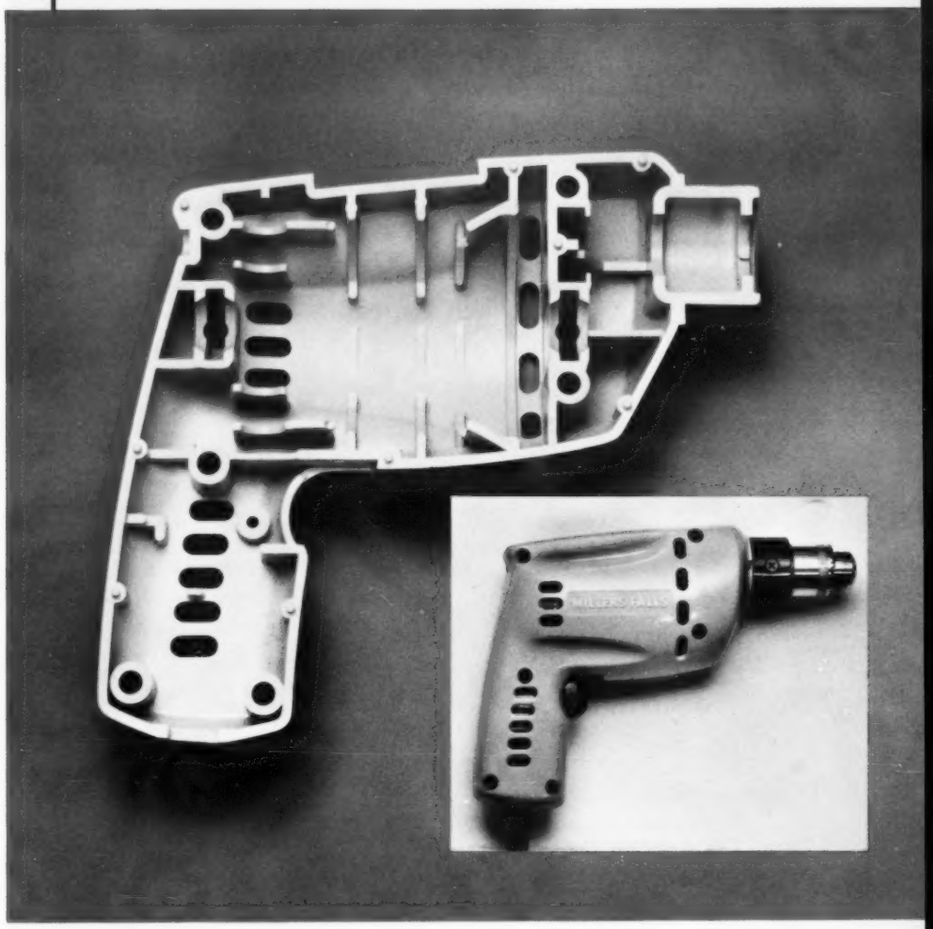
Circle 67 on Reader-Service Card

working with

Du Pont Zytel®

nylon resins

one of Du Pont's versatile engineering materials



New drill housing of ZYTEL® NYLON RESINS insulates ...eliminates costly machining operations

A basic design advance in power tools, this ¼" drill is made with a nonconductive housing of Du Pont ZYTEL nylon resin. Double-insulated, it protects the user against shock hazard. Other design advantages include a weight saving: the housing of ZYTEL is 20% lighter than a comparable housing of aluminum. It is self-extinguishing. It stays comfortable to the touch in hot and cold weather and after prolonged use. It is rugged, durable and impact-resistant.

In addition, the use of ZYTEL affords substantial production advantages. The two halves of the drill housing, though complex in design, are quickly and easily molded. The excellent dimensional stability of ZYTEL assures a perfect match of each half for screw inserts, assembly and flange matings. And the housing requires no machining operations whatever.

Molded by Nylon Products Corp., affiliated with F. J. Kirk Molding Co., Clinton, Massachusetts, for Millers Falls Company, Greenfield, Mass.

On the following page you will find additional examples of practical design improvements made possible by the combination of properties that ZYTEL nylon resins offer.

DU PONT

REG. U.S. PAT. OFF.

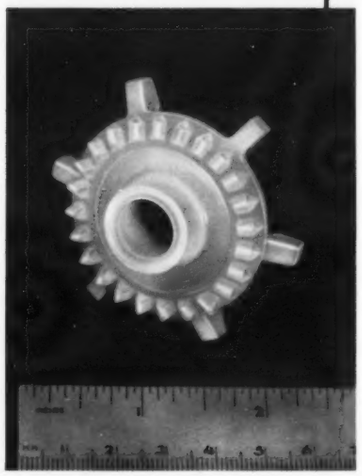
BETTER THINGS FOR BETTER LIVING ...THROUGH CHEMISTRY

working with

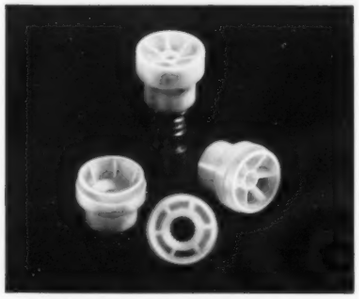
Du Pont Zytel® nylon resins

one of Du Pont's versatile engineering materials

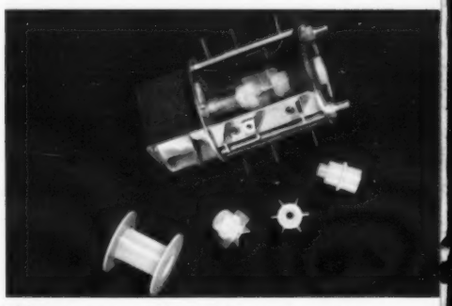
Parts of ZYTEL® NYLON RESINS perform reliably under attack by heat, impact and chemicals



This oil slinger swirls oil onto vital engine parts. It must be tough, resistant to impact, abrasion and attack by oil at high temperatures. ZYTEL provides all these resistant properties and permits economical injection molding of the part. (Molded by Sinko Mfg. & Tool, Chicago, Ill., and Danielson Mfg. Co., Danielson, Conn., for Briggs & Stratton, Milwaukee, Wis.)



These faucet-handle inserts are designed for interference-fit assembly and to act as an insulator against heat. These rugged parts of ZYTEL will withstand 116 inch-pounds torque at the stem between 20° and 160°F. They are expected to give at least 20 years of efficient service. (Molded for American Radiator & Standard Sanitary Corp., New York, New York.)



This compact switch relay uses parts molded of ZYTEL to withstand rugged treatment and yet operate quickly, smoothly and positively. Necessary in this application are good heat resistance, good electrical properties and high strength in thin sections. ZYTEL fills the bill. (Molded by Ritepoint Pen & Pencil Co., for Warco Industries, both of St. Louis, Missouri.)

An important factor in the design versatility of ZYTEL nylon resins is their ability to be molded to accurate tolerances without costly machining. Equally important is the wide variety of ZYTEL nylon resins available to meet special problems. All ZYTEL compositions have the basic properties of low friction, impact and abrasion resistance, high strength and resistance to chemicals.

Du Pont ZYTEL may help you, too, to improve the performance or the economics of a part or product. The coupon below will bring you information relating to your own problem or field of interest.

POLYCHEMICALS DEPARTMENT

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING ... *THROUGH CHEMISTRY*

E. I. du Pont de Nemours & Co. (Inc.), Dept. 1
Room 2507Z, Nemours Building, Wilmington 98, Delaware.

Please send me: ☐ How 50 Manufacturers Used ZYTEL® Nylon Resins to Make Better Products (A)
☐ Designing with ZYTEL® (B)

I am interested in evaluating ZYTEL for _____ (C)

Name _____ Position _____ (D)

Company _____

Street Address _____

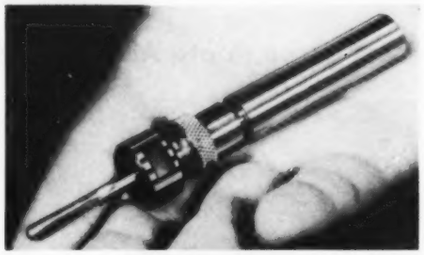
City _____ Zone ____ State _____

Type of Business _____

ZYTEL® *nylon resins*

Alathon® · Delrin® · Lucite®

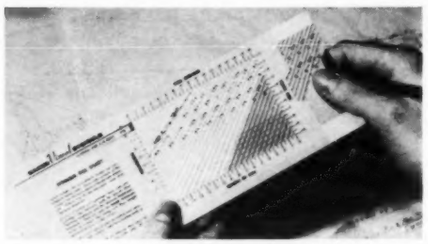
Non-Releasing Tap Holders 332



These useful instruments may be used as either releasing or non-releasing tap holders on all machines with reversing spindles. Smooth in operation, they convert any machines on which they are used into precision tapping units. Self-feed feature, if employed, guarantees production of gage-perfect threads even when used for re-entry with finishing taps for tapping in two operations. Length of pull-out for releasing can be varied from 1/16 to 3/4 inch by an adjustment of knurled depth-control collar. Accurate thread depth is maintained by adjustable releasing feature. The tap holders are presently available in the following tap capacities: 5/8-inch dia from 0 to 12; 1-inch dia from 0 to 1/2 inch, and 1 1/4-inch dia from 10 to 5/8 inch.

Tapmatic Corp., 845 W. 16th St., Costa Mesa, Calif.

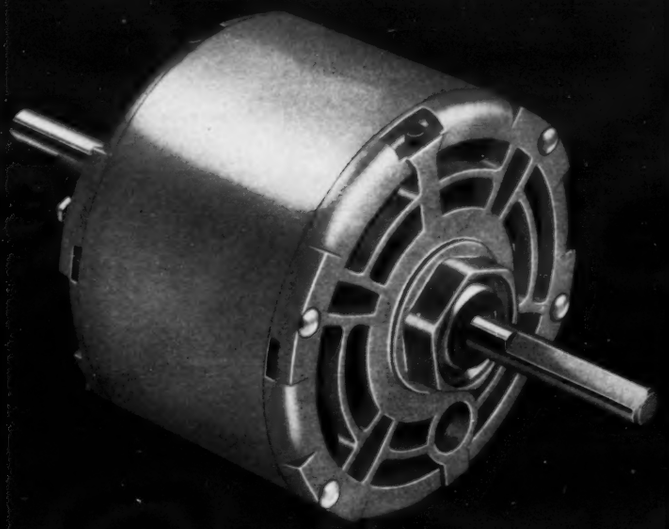
Stair-Building Calculator 333



This service tool gives accurate answers to complicated stair questions in a matter of seconds. The computer will prove itself invaluable to architects, draftsmen, contractors and carpenters. By setting the known total rise in inches at the arrow on this pocket-sized calculator, user can directly read the proper number and height of risers as well as other usable combinations. Reverse side of the handy device contains a 1/4-1-inch, cross-sectional drawing of a typical well opening with all parts identified. The unit is a "working" blueprint for each and every stair application.

Emmert Products Co., Stairule Div., Box 221, Sycamore, Ill.

SPECIFY LEECE-NEVILLE MOTORS FOR QUALITY, RUGGED DESIGN, LONG LIFE



ECONOMY AND RUGGED STRENGTH—Model 6D Shaded Pole. 6 Pole—1050 rpm—1/12 to 1/4 hp. Quiet, smooth running power . . . ideal for air conditioning, refrigeration and heating service.

Model No. 2A—Shaded Pole for small pumps, fans, ventilators, blowers. 2 Pole—3,000 rpm.
Model No. 4C—Shaded Pole for fans, ventilators, small blowers. 4 Pole—1,550 rpm.
Model No. 4D—Shaded Pole for blowers, pumps, air conditioning. 4 Pole—1,550 rpm.
Model No. 6C—Permanent Split Capacitor for refrigeration, fans, blowers. 6 Pole—1,050 rpm.
Model No. 6E—Permanent Split Capacitor for room air conditioners. 6 Pole—1,050 rpm.

QUALITY ELECTRICAL EQUIPMENT
Leece-Neville
SINCE 1909

LEECE-NEVILLE now offers you a complete line of shaded pole and permanent split capacitor motors—basic units adapted to your specifications, or special motors custom engineered to your requirements—with horsepower ratings from 1/150 to 1/2 hp. All L-N motors are capable of meeting U.L. and C.S.A. application tests. Leece-Neville has more than 50 years of experience manufacturing motors and other electrical equipment, and modern facilities assure not only top quality, but also delivery to your schedules and lead times. For full information, just mail the coupon at right.

The Leece-Neville Company, Dept. DN-3
Georgia Division, Gainesville, Georgia

Please forward details on your shaded pole and permanent split capacitor motors.

*Name*_____ *Title*_____

*Company*_____

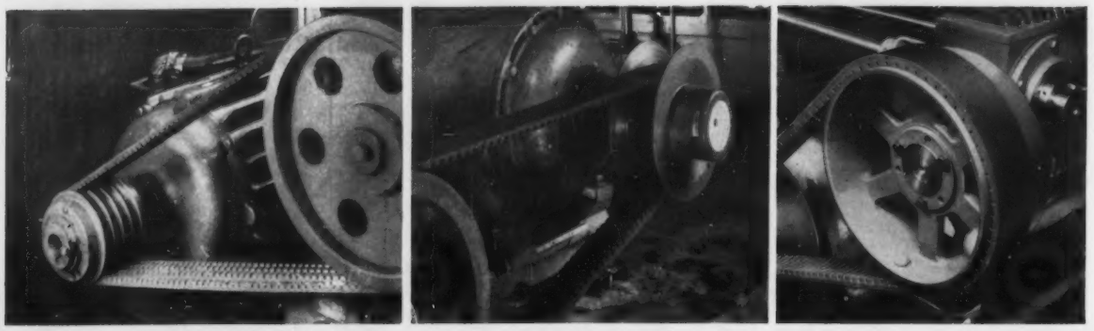
*Address*_____

*City*_____ *Zone*___ *State*____

*Type of product*_____

Circle 68 on Reader-Service Card for more information

Circle 67 on Reader-Service Card



Wood's specialization provides the right drive to solve your belted transmission problems . . .

. . . particularly if your problems involve horsepower, high, low or variable speeds, drive efficiency, space, economy or availability.

This is because Wood's people are specialists in the production, selection and application of *all* basic types of belted drives.

We are able to provide the *right* drive for a specific application because we manufacture all of the basic types. So, drive problems can be solved by Wood's fast and economically.

To the breadth of Wood's belted power transmission line, add depth of engineering and manufacturing experience (104 years, to be specific). This depth of experience is another element of specialization that enables Wood's to offer not only unique product advantages, but consistently high performance as well.

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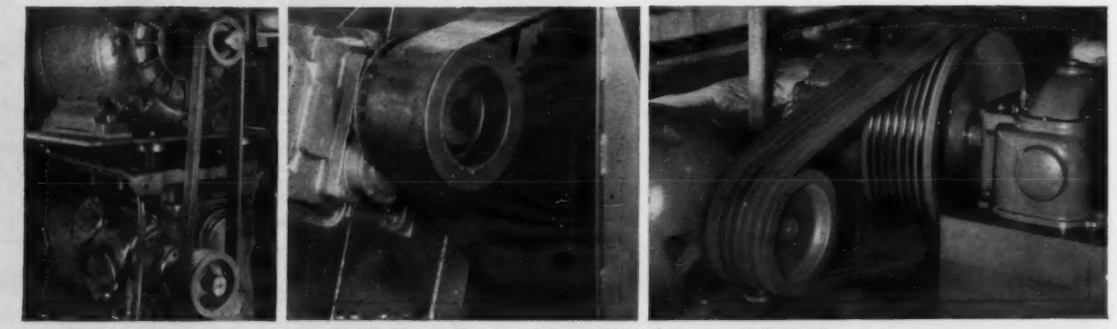
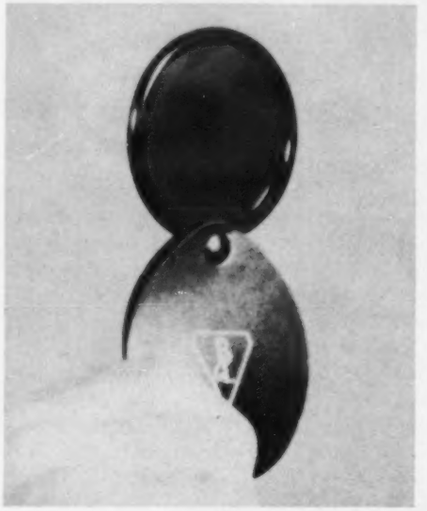


Circle 69 on Reader-Service Card for more information

Pocket-Sized Photo Aid 334



This handy, inexpensive aid permits photographers to see actual "finished picture" detail before the shutter is snapped. Filter of the "Contrast Ratio Viewer" reveals to photographer the light balance and shadow detail which would appear in final print or transparency. The photographer can study shadow detail just as the camera sees it and as it will be recorded. The viewer is equally useful whether shooting with color or black-and-white film, indoors or out. A 2-inch-dia filter permits easy viewing, and attached case serves as a handle. The pocket-sized viewer is lightweight, yet durably constructed with plastic rim and case which prevents scratching.

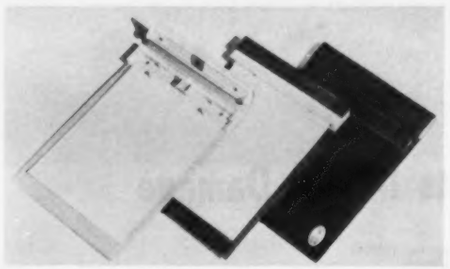
Bausch & Lomb, Inc., Rochester 2, N. Y.

Rubber Hardness Gage 335

Hardness of rubber and other elastomers may be measured instantly with the model 1600 by holding gage in vertical position and pressing down until entire foot encounters specimen. The large dial with 360-deg sweep provides ease of reading. Readings are given accurately to $\pm 1/2$ Durometer point. The unit is of rugged construction, never requires recalibration or adjustment and all parts are wear- and corrosion-resistant. Weight of the device is 8 oz.

Rex Gage Co., Inc., P. O. Box 46, Glenview, Ill.

Space-Saver Notebook 336



A new departure from the conventional side-mounted ring binder, this writing aid is a notebook designed to make writing easier, save space and increase efficiency. The "Magnetic Space Saver" has a multitude of related uses for office, conference room and travel. Two posts at top hold filler paper in place. A magnetic lock keeps paper securely in binder. The device is made of washable vinyl plastic which is light and rigid. Folded halfway back, binder can be set up in easel fashion to assist in transcribing notes. Binder is available in six colors: light and dark blue, light and dark brown, white and green. Loose-leaf fillers may be purchased either ruled or unruled, in several sizes.

Nifty Mfg. Co., Birmingham 3, Ala.

Tweezer Soldering Tool 337

This tweezer-shaped soldering instrument has separate heating elements in each arm, which develop 572F temperature at 1/32-inch tips. Designed for use with low-temperature solders to protect diodes, transistors and bimetals, tweezers can be used to position and hold work rigidly while soldering and allow operator an unobstructed view at all times. Both sides of the circuit module can be heated simultaneously to eliminate cold joints and reduce heating time to a minimum. Weighing only 1 oz, the instrument is 6 inches long and operates on 6v d-c. Low voltage eliminates shock hazard to operator and also eliminates handle heat. A 6v transformer is available.

Oryx Co., 13804 Ventura Blvd., Sherman Oaks, Calif.

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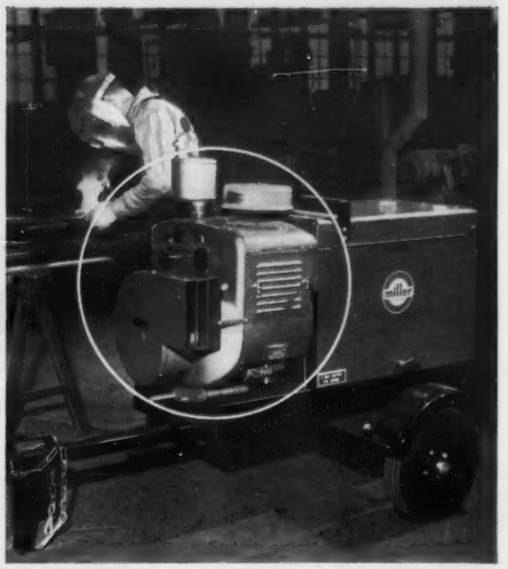

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Plastic Windshield Resists Impact Damage

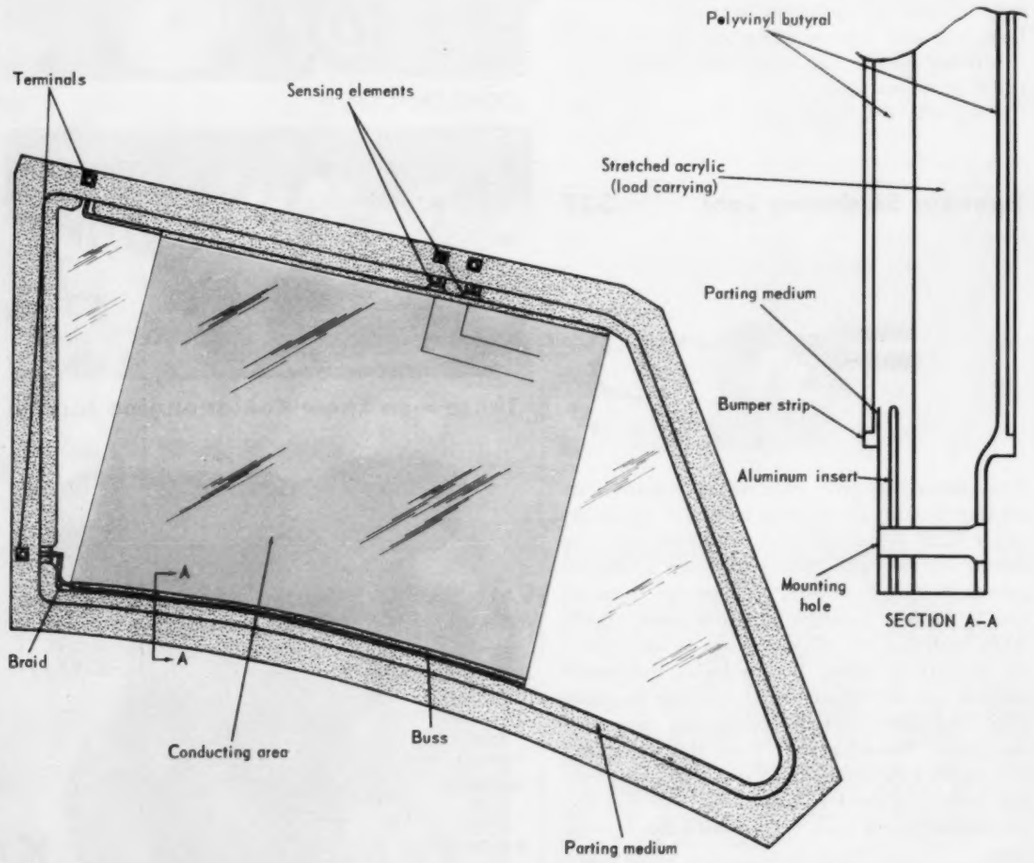
Edward W. Schrader, Western Editor

An all-plastic, electrically heated windshield resists bird impact damage. The windshield has been selected by North American Aviation for use in the T-39 Sabreliner Jet Trainer.

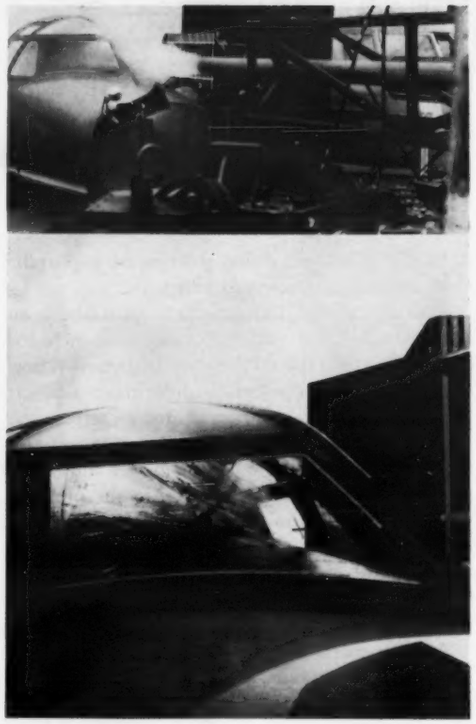
The laminated transparent windshield uses a stretched-acrylic inner ply. This is the load-carrying member. The interlayer is polyvinyl butyral. The outer ply is a wiper-abrasion-resistant, modified polyester. This material is designated Sierracin-900.

A transparent conductive coating is applied to the inner surface of the outer ply. When energized, this conductive coating produces heat for antifogging and anti-icing. The heat also keeps the vinyl interlayer at its optimum flexible temperature. This basic configuration has been designated the Nobort Windshield and is a design development of The Sierracin Corp., Burbank, Calif.

The load-carrying member bolts to the wind-



CROSS-SECTION of laminated plastic windshield. Aluminum insert around edge serves as mounting reinforcement for attachment to aircraft structure. Windshield has deicing capability for most of area.



WINDSHIELD impact test of configuration NAA T-39 Sabreliner. Material does not shatter. Cabin retains pressurization. Masking tape cross is for aiming air gun.

shield frame by means of the vinyl-metal reinforced edge attachment. Heat from the energized conductive coating maintains the vinyl in a flexible condition, thus giving a diaphragm action to the windshield. Upon bird impact, the windshield normally will crack in a localized area. It does not shatter or become completely opaque as glass generally does.

Uniform heat pattern of the conductive coating eliminates hot spots and therefore increases thermal shock resistance. Also, a larger area of the windshield is heated. The plastic-vinyl lamination is more compatible than a glass-vinyl configuration. This greatly reduces the possibility of delamination under extreme temperature changes.

In the North American T-39 Sabreliner, the windshield has a heated area of 380 sq in. Standard on-board voltage of 208v a-c is used to energize the windshield. This produces a heat output of 4½w per sq in in the center portion. It tapers to 2w per sq in at the ends.

The T-39 Plastic Heated Windshield is a combined design effort of North American Aviation and the Sierracin Corp.

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Gasket engineering

THE PROPER USE OF SPECIFICATIONS

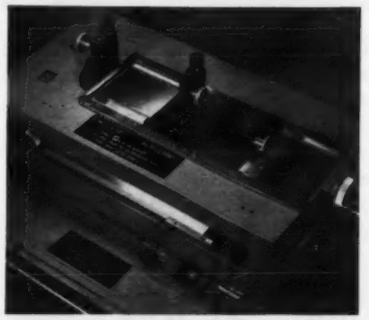
Specification testing is useful as a method of quality control. But specifications alone do not form a sound basis for gasket selection or predicting gasket performance, since performance is determined by the interaction of many factors.

EDISON POWERS
Armstrong Research and Development Center

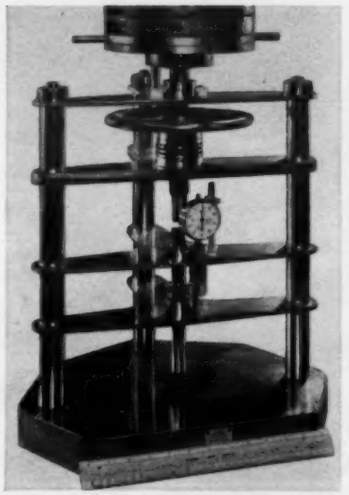
A resilient gasket material that meets all pertinent government and industry specifications may still fail to provide a satisfactory seal in actual service. At the same time, a material that falls short of one particular specification may well be the most suitable for a certain application.

The reason for this is that gasket performance is determined by many factors—such as flange pressure, contained fluid, qualities of the material—in infinite combinations. It is impossible to set up tests which will take all the combinations of these factors into consideration.

As a result, specifications frequently do not give a realistic idea of the gasket's performance. For instance, many gasket specifications have rigid tensile strength requirements. Tensile strength is easily measured. Yet it usually has little bearing on the sealing ability of a material. For all practical purposes a gasket needs only sufficient tensile strength to hold its shape until it goes to work in the flange.



This Armstrong-developed instrument—called a dilatometer—is used to study dimensional changes in gasket materials caused by different conditions of temperature and humidity. It can detect variations as small as half a mil in a 12" sheet.



This device is used by many laboratories to help standardize gasket testing. Developed by Armstrong and recognized by the National Bureau of Standards, it is used to measure indentation and recovery characteristics of resilient gasketing materials.

Tests for resistance to liquids are also unrealistic where uncompressed strips of gasket materials are completely immersed in various fluids. Test results may show intolerable changes in such factors as volume, compressibility, recovery, and elongation. In practice, however, only the edge of the gasket is exposed, and the effect of the fluid may be negligible.

Other tests—ream weight and bursting strength, for example—have been taken from the paper industry. Again they are of little help to gasket users in selecting materials.

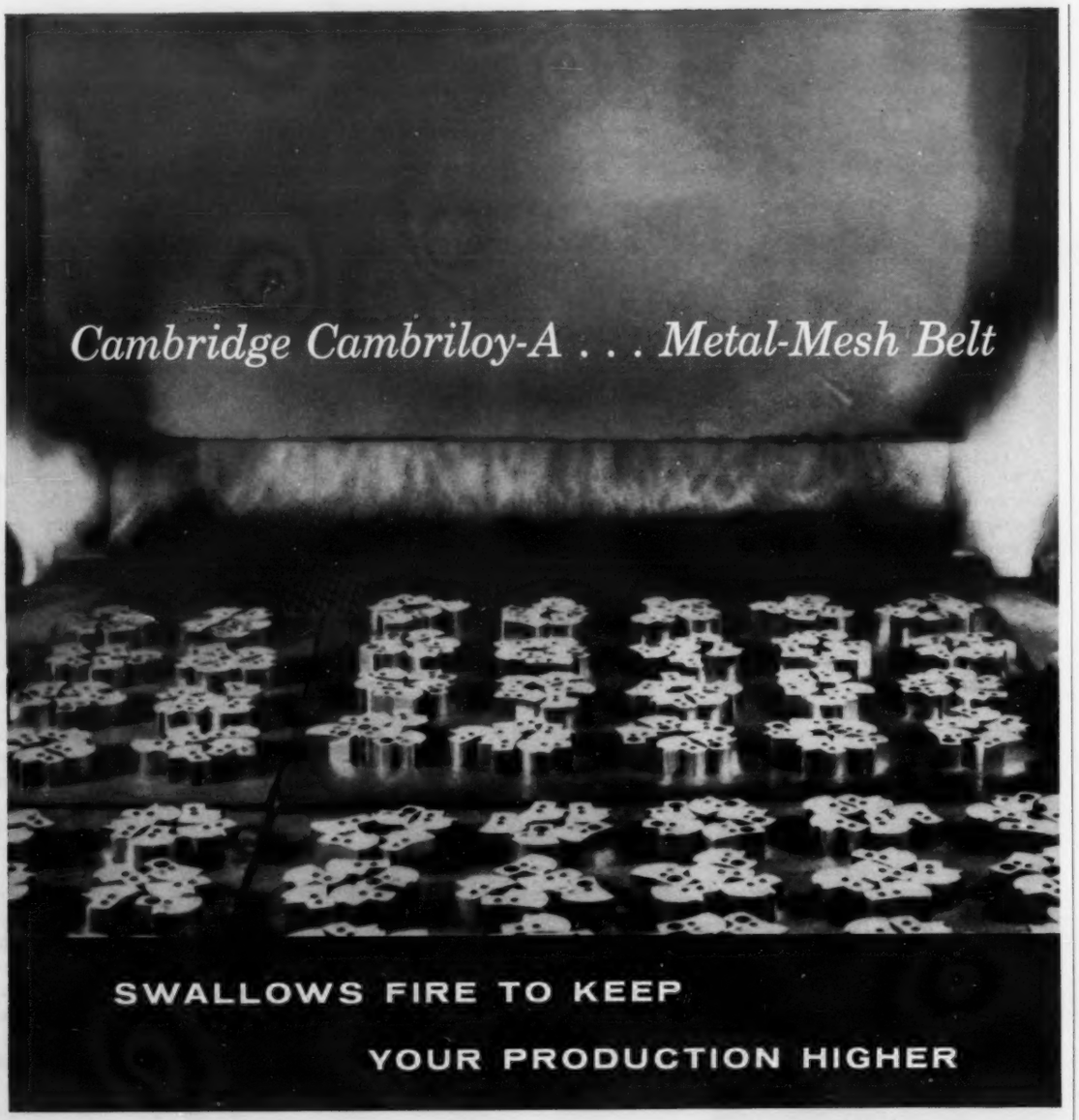
Compounding the difficulties of selection by specification is the lack of standardization in test procedures and instruments. In the matter of compressibility alone, there are the variables of sample size and type of pressure foot, and the method and speed of load application.

Another difficulty with the practice of buying gaskets by specification is the fact that it may delay the discovery and use of new materials that will do the job better. Unless specifications are frequently reviewed, they are likely to be outdated.

Gasketing efficiency can be improved by asking the question, "Will it do the job better?", when you select a material rather than, "Does it meet our specifications?" Once you have selected the proper material, you can establish new specifications and then put specification testing to its proper use—as a means of quality control to make sure that each succeeding shipment of gasket material has the same physical and chemical characteristics.

The Armstrong Gasket Design Manual offers a wealth of research material on gasket design and selection. If you would like help in selecting a gasket material or establishing new specifications or a copy of the manual, write Armstrong Cork Company, Industrial Division, 7103 Ithaca St., Lancaster, Pennsylvania.

Armstrong GASKET MATERIALS



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Steel Stamping Improves

Victor W. Wigotsky, Eastern Editor

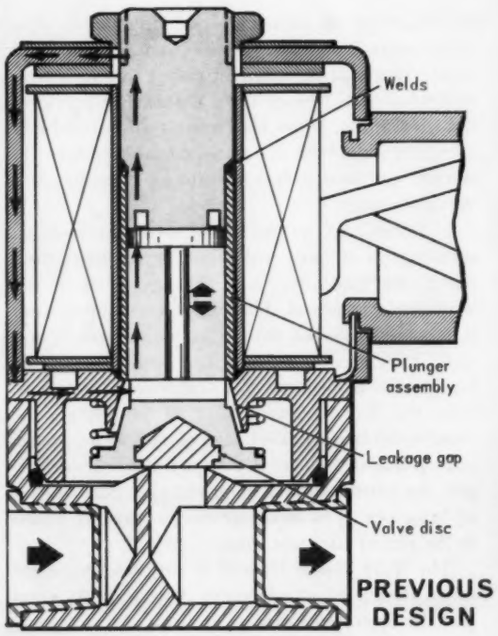
A stamping of cold-rolled steel is an important element in a new solenoid valve.

Redesign of the plunger guide assembly, from its original three parts to two, also included elimination of tapered head construction. However, the taper is normally beneficial, since it provides additional upward force across the leakage gap. The steel stamping compensates for loss of the tapered construction by additional surface area for flux penetration to the plunger.

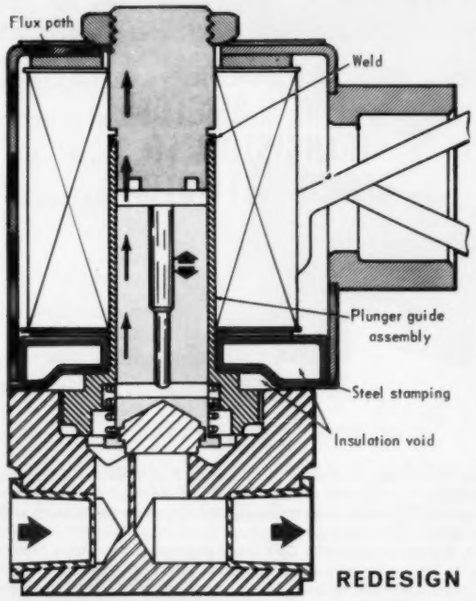
The stamping also improves heat dissipation characteristics by providing an insulating void between coils and valve body. Coil temperature can be more independent of temperature of the working fluid.

Another effect of the redesign is a decrease in the size of the cavity which contains the fluid. This permits additional metal in the flow area. Heat-conduction volume is increased as well as separation of coil from fluid, without increase in overall size. The cooler coil temperature better maintains the valve rating.

The solenoid valve was designed by Allied Control Co., Inc., New York, N. Y.



Valve Operation



REDESIGN

TWO-PIECE CONSTRUCTION of valve's plunger guide assembly facilitates accurate alignment and quiet operation. Eliminating one continuous weld reduces possibility of misalignment caused by metal contractions as weld is being performed. Equivalent pressure rating is maintained, in spite of elimination of taper in plunger head, by use of stamping consisting of washer with cylindrical section. This increases flux penetration surface. Insulation void permitted by stamping also helps keep coil temperature at desired level. Pressure range of two-way normally closed a-c valve is from zero to 400 psi. Standard valve handles fluids at temperatures up to 185F.

Here are some examples of unusual applications for high alumina and steatite ceramics. The customers' design engineers posed the problem; Centralab's ceramic engineers—with their wealth of experience—did the rest. Complete ceramic assemblies—ready for installation in your equipment—with tolerances to ±.00025" can readily be produced in their entirety in Centralab's modern facilities.

For additional information write for Centralab catalog 42-221 or consult Sweet's Product Design File (Folio 4a/ce).

1. **Extrusion Die:** For metal extrusion. 95% alumina outlasts alloy dies 5 to 1. Tolerances to .0005".

2. **Pump Idler Gear:** 95% alumina machined to ± .0005". Gears up to 3" diam. available. For pumping corrosive liquids.

3. **Jet Fuel Pump Piston and Sleeve:** Steatite machined with clearance of .0005" between sleeve and piston over entire length.

4. **Valve Spigot** 95% alumina polished to 3—5 helium light bands, outlasts nickel-chrome alloy 5 to 1.

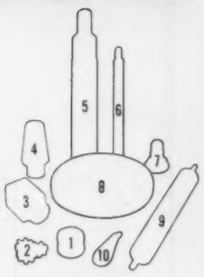
5-6. **Pump Plungers:** Surface finish of 16 micro inches. Available up to 18" long, 4" diam., not including metal attachments.

7. **Valve Seat:** Outwears hard rubber 10 to 1. Machined before firing in one operation.

8. **Antenna Insulator:** Highly glazed steatite for high voltage use. Metal attachment has bond strength of 8000 psi.

9. **Condenser Shaft:** Concentricity is ±.001 T.I.R. over entire length. Provides dimensional stability over a wide temperature range.

10. **Contact Rotor Assembly:** 85% alumina arm with precision rotor. Used to eliminate flashover and electrical breakdown.



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DESIGN DATA NEWS

Perimeter of an Ellipse

R. H. Warring, Beckenham, Kent, England

The standard formula for calculating the perimeter of an ellipse arithmetically is tedious and awkward to use:

$$P = \pi(A + B)\left[1 + \frac{(A - B)^2}{4(A + B)^2} + \frac{(A - B)^4}{64(A + B)^4} + \frac{(A - B)^6}{256(A + B)^6} + \cdots\right]$$

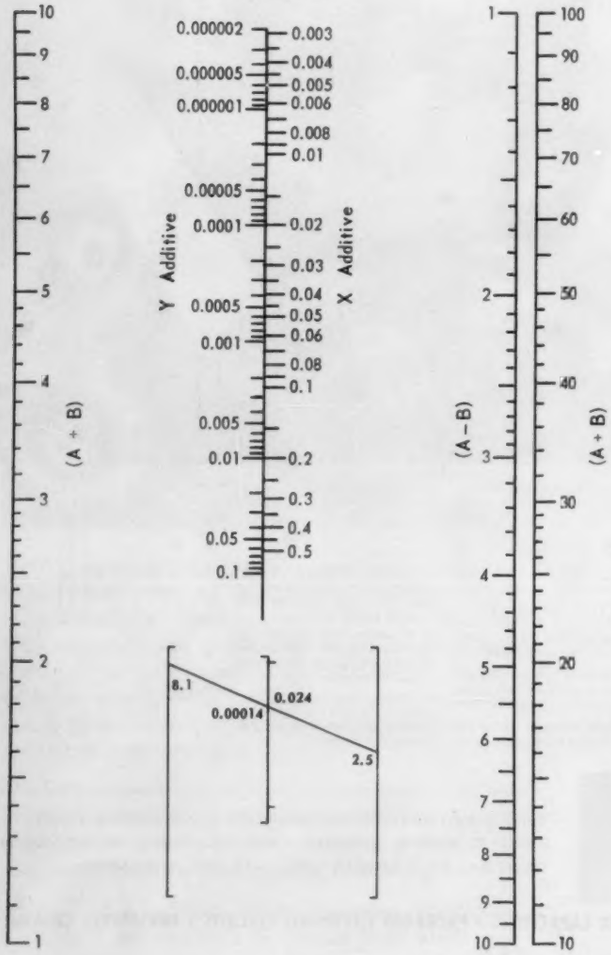
An approximate solution is given by calculating perimeter as (π) $(A + B)$, but this is only valid when $(A - B)$ is very small.

The nomograms have been constructed to enable the basic formula to be applied rapidly to the practical order of accuracy required. The basic formula is rewritten:

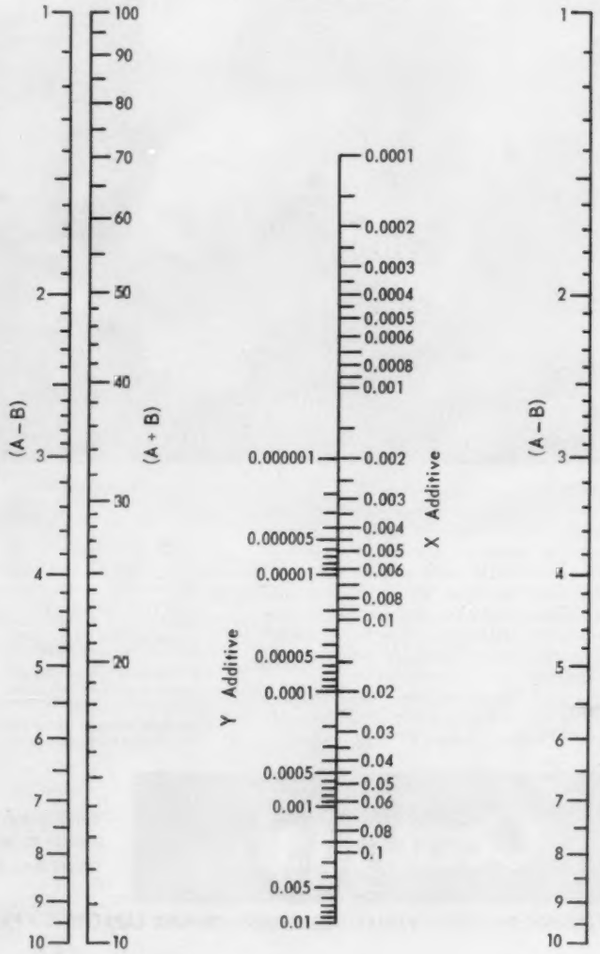
$P = \pi(A + B)(1 + X + Y)$

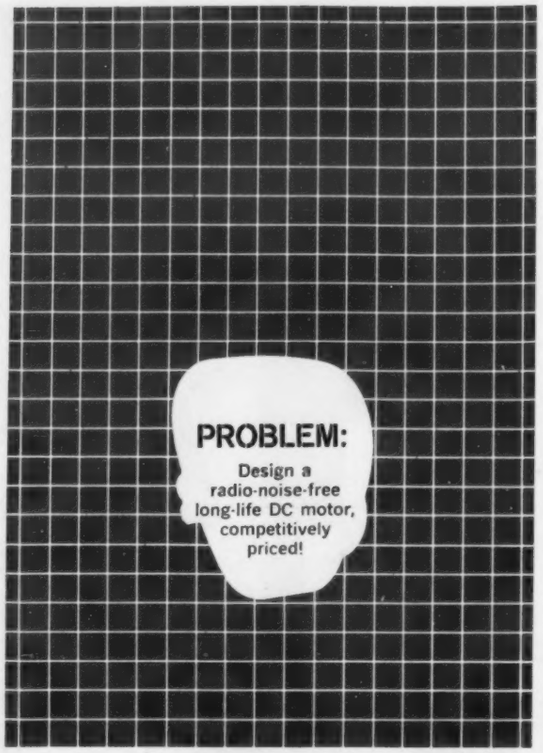
Nomograms I or II give immediate solutions for

NOMOGRAM I



NOMOGRAM II





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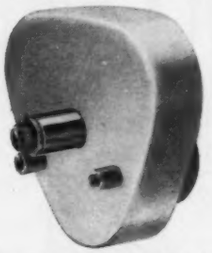

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Dept. DN-3

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"X" and "Y" for the known (A + B) and (A — B) values. Use either Nomogram I or Nomogram II, according to the (A + B) scale value required. The "X" additive is read off the top center scale and the "Y" additive off the bottom center scale in both cases.

The appropriate value of (1 + X + Y) is then entered on the right-hand scale of Nomogram III and connected to the (A + B) value on the left-hand scale. Perimeter is read off the intersection on the center scale.

Example:

If in a given ellipse A = 5.3 inches and B = 2.8 inches, find the perimeter.

Solution:

(A + B) = 8.1 inches

(A — B) = 2.5 inches

Using these values on Nomogram I:

X additive = 0.024

Y additive = 0.00014

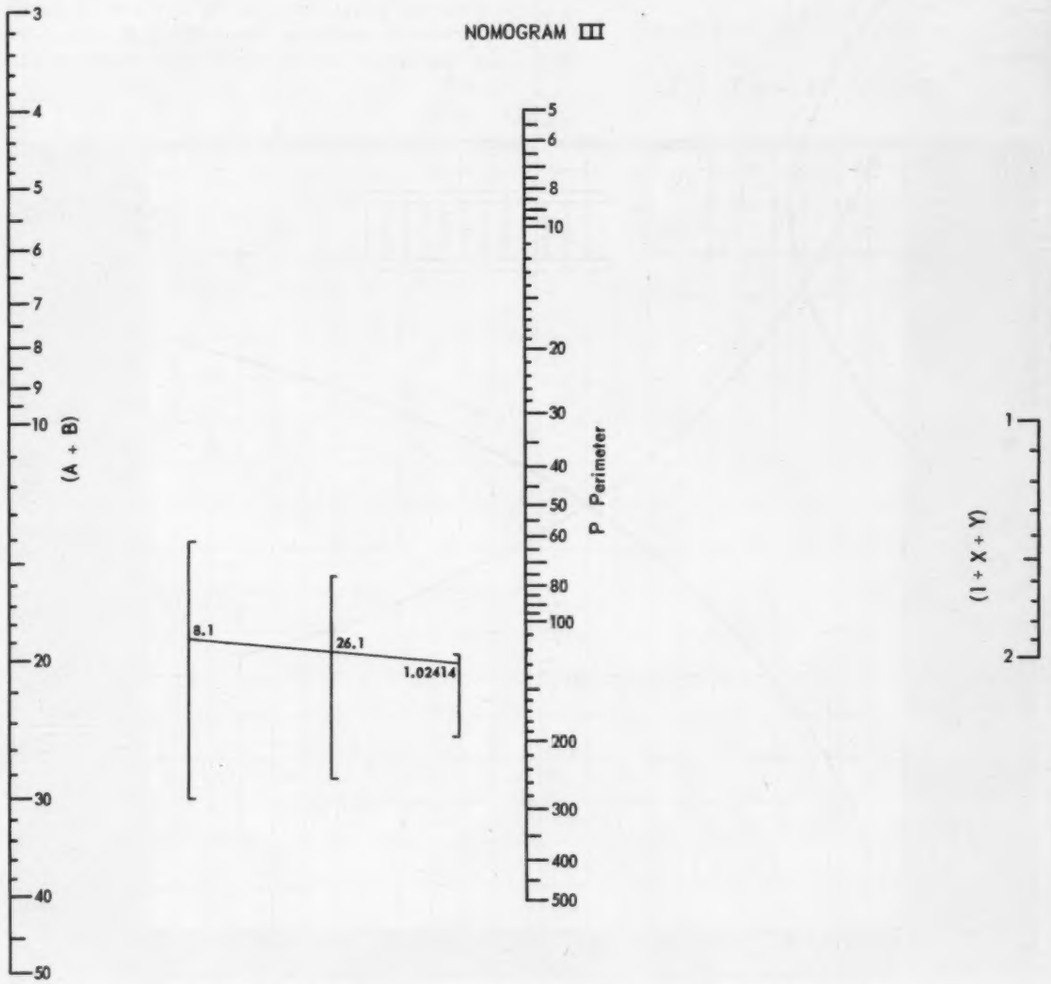
$\therefore$ (1 + X + Y) = (1 + 0.024 + 0.00014) = 1.02414 (Note: The "Y" value is small enough to ignore for most practical purposes.)

Enter (1 + X + Y) = 1.02414 on Nomogram III and read P = 26.1 inches.

For accuracy greater than that given by Nomogram III, Nomograms I or II can be used for obtaining the "X" and "Y" additives and the final solution worked by logs.

Nomogram III also can be used for quick, approximate solutions by ignoring the additives and projecting across to value 1 on the right-hand scale.

NOMOGRAM III



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Thermal Stresses in Sandwich Structures

B. Saelman, Lockheed Aircraft Corp., Burbank, Calif.

The following equations are based on the assumption that the core takes no load; i.e., shear deformation of the core would relieve the stresses in the skin.

For compatibility of strain:

$$\varepsilon = \frac{\sigma_1}{E_1} + \alpha T_1 = \frac{\sigma_2}{E_2} + \alpha T_2 \qquad (1)$$

and for static equilibrium:

$$t_1 \sigma_1 + t_2 \sigma_2 = 0 \qquad (2)$$

Assuming $E_1 = E_2 = E$, and solving Equations (1) and (2), we have:

$$\sigma_1 = -\frac{E\alpha \Delta T}{1 + (t_1/t_2)} = -K_1 E\alpha \Delta T \qquad (3)$$

$$\sigma_2 = \frac{E\alpha \Delta T}{1 + (t_2/t_1)} = K_2 E\alpha \Delta T \qquad (4)$$

Where:

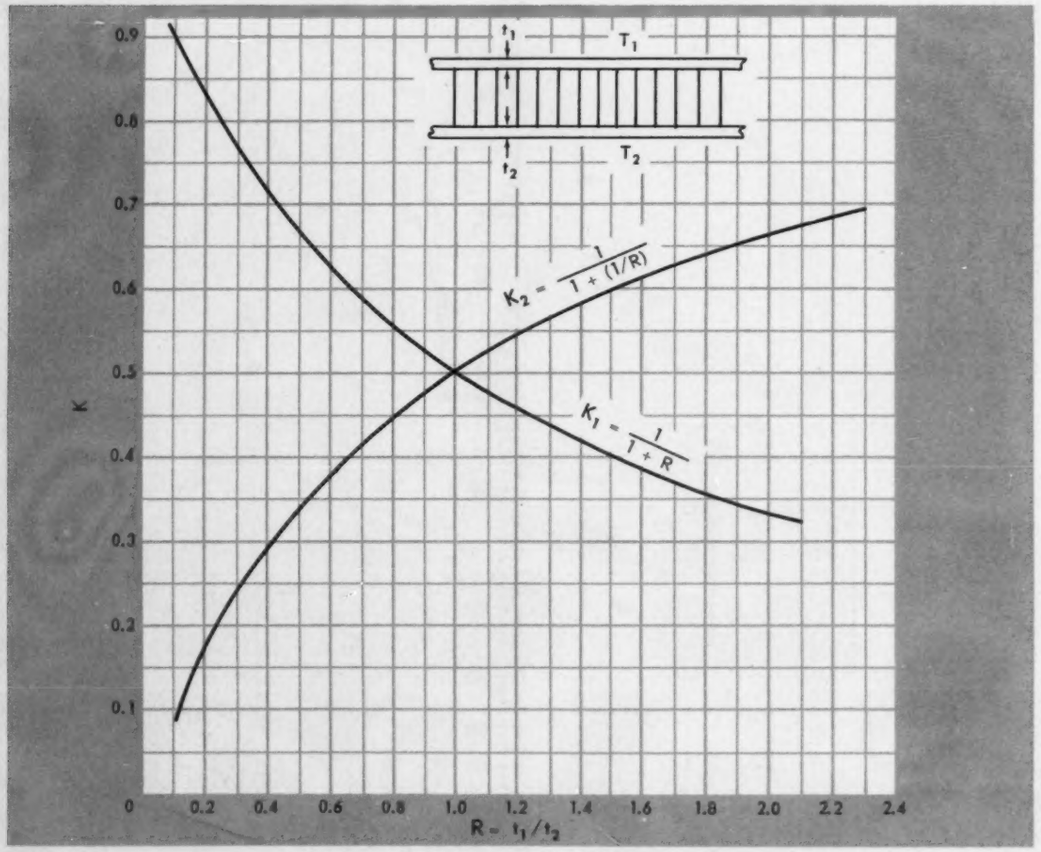
$$\Delta T = T_1 - T_2 \text{ and } T_1 > T_2$$

$$K_1 = \frac{1}{1 + R} \cdot K_2 = \frac{1}{1 + (1/R)} \text{ and } R = t_1/t_2$$

Nomenclature:

- t = thickness of skin, inches
- T = temperature of skin, degrees F
- E = modulus of elasticity, psi
- α = coefficient of thermal expansion, inch/inch/deg F
- σ_1 = compressive stress, psi
- σ_2 = tensile stress, psi

From the graph below, values of K may be found by projecting vertically from value of $R = t_1/t_2$ to the appropriate curve, thence horizontally to the K scale.



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Complete
AIR CONTROL
REGULATOR—FILTER—LUBE
gives an accurate, steady flow of air efficiently lubricated and filtered of condensate and dirt.
Protects air operated tools and equipment from pressure surges, scoring, rusting and damage due to "dirty" air. Gives trouble free service.
• Less Maintenance
• Less costly repairs
• Less down-time
PSC
Refill lubricator without stopping operation or shutting off air.
Compact, combination—easy to install—only 2 connections.
Write for Bulletin No. 80 listing complete line of regulators, lubricators, filters, drain traps, dehumidifiers, and blow guns.
PERFECTING SERVICE CO.
332 Atando Ave. Charlotte, North Carolina
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1. 80% of spring pin applications only require Medium Duty SPIROL PINS, which cost less.
2. Even the Heavy Duty SPIROL PINS in this socket-wrench universal joint don't cost more than other types of spring pins.
3. Assembly costs are lowered with SPIROL PINS! Just drill the hole (plus and minus tolerances allowed only by SPIROL PIN) and drive the pins—automatically or by hand.
4. Medium and Light Duty SPIROL PINS replace more costly fasteners, even in materials where other spring pins cannot be used. Come in Miniature Diameters, too: 1/32" to .052".

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C. E. M. COMPANY, INC.
42 School Street, Danielson, Conn. • PRescott 4-8571

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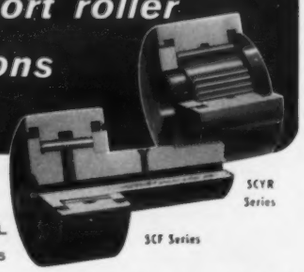
Protected performance in cam follower, guide and support roller applications



Sealed and pre-lubricated McGILL CAMROL® bearings

Protect your roller follower applications for longer life with sealed CAMROL bearings. McGill packs high load capacity, precision accuracy, and positive seals into standard bearings. Avoid building up special units. The SCF series is complete with integral stud. In the SCYR series an inner race provides for shaft mounting. Black ferrous oxide finish adds corrosion resistance. Roller diameters range from ¾" to 4".

Write for helpful Bearing Handbook No. H-54-B

engineered electrical products
McGILL®
precision needle roller bearings

McGILL MFG. CO., Bearing Div., 203 N. LAFAYETTE ST., VALPARAISO, IND.

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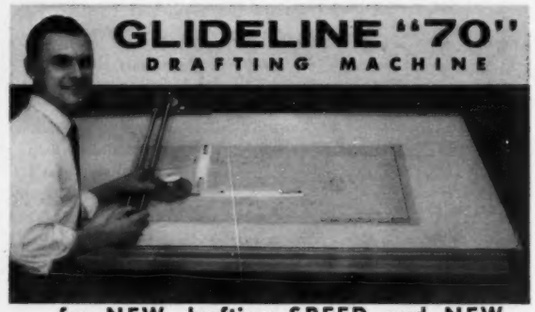
GLIDELINE "70"
DRAFTING MACHINE



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because:

Glideline has brought to engineering the first major changes in drafting machine design in 50 years. Changes that effect major time savings and greatly lessens fatigue. Changes that demand your immediate investigation.

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***WRITE FOR BULLETIN M70 TODAY**

GLIDELINE
CORPORATION
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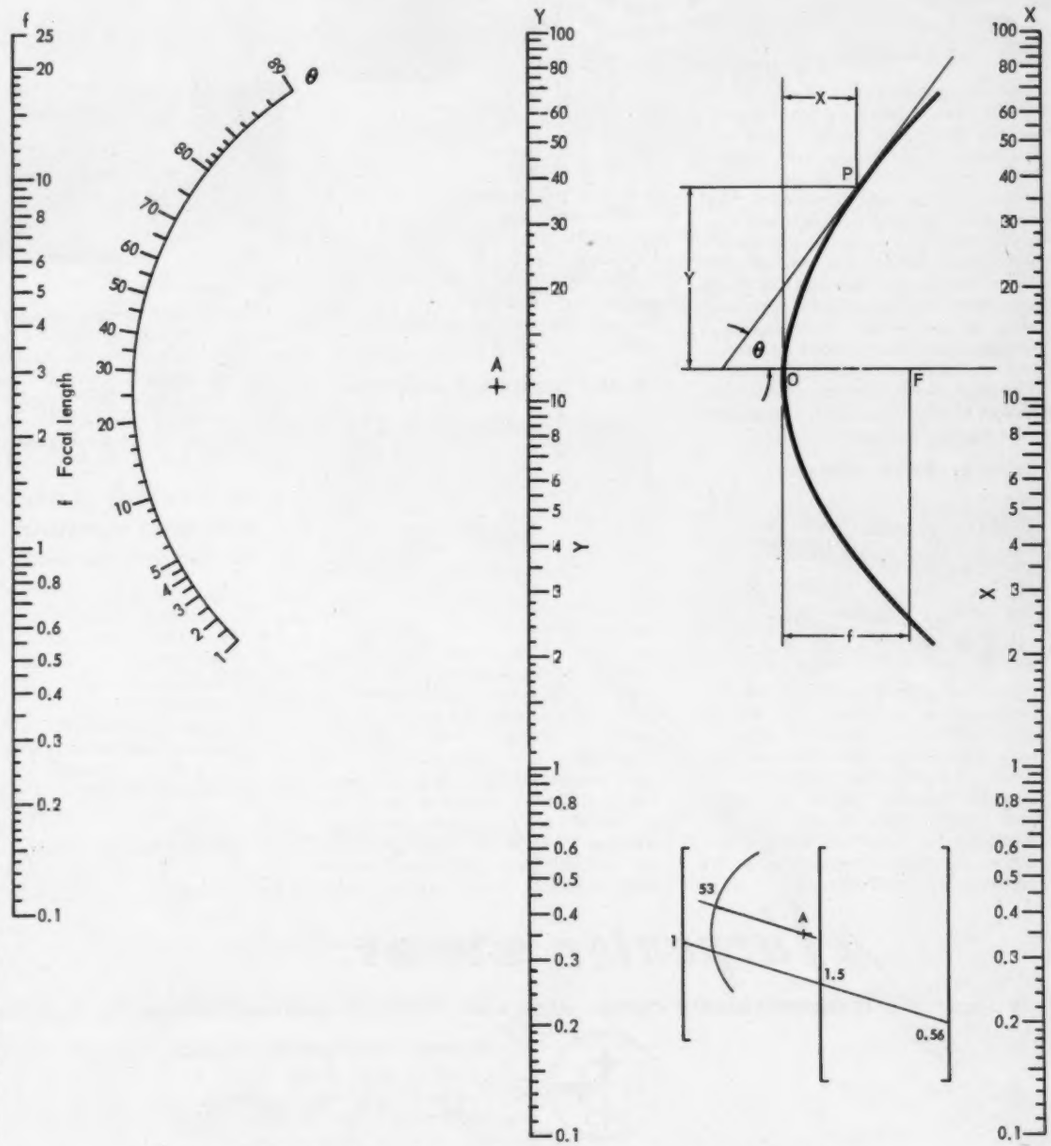
Coordinates of a Point on a Parabolic Curve

Richard Wadler, Mechanical Engineer, Raytheon Co., Bedford, Mass.

This nomogram represents a simple means for determining coordinates X and Y of a point P located on a parabolic curve with a focal length f. The nomogram also can be used to find the angle Θ of the tangent line through point P.

Example: If f = 1.0 and Y = 1.5, find X.

Solution: Align f = 1.0 with Y = 1.5 and read X = 0.56. Draw a parallel line through point A and read Θ = 53 deg.

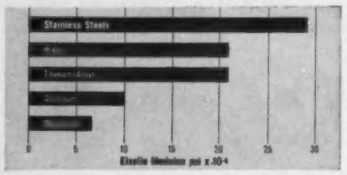


For Free Reprints of the Above Article, Circle 531 on Reader-Service Card

How to improve product design through better material selection

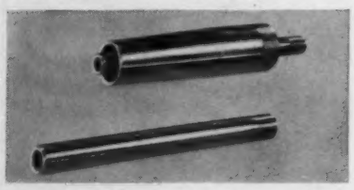
This advertisement is one of a series on the advantages of Carpenter Stainless Steel. As a handy reference for material selection, these data can pave the way for successful results on your next assignment.

Higher elastic modulus



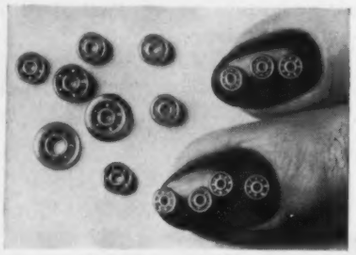
The elastic modulus of an alloy is one of the most important properties used in the design of springs, fasteners, diaphragms and many other components subject to stress in service. Materials with a high modulus deform very little under load; materials with a low modulus may be completely unsatisfactory because of excessive dimensional change. Stainless steels with a modulus of about 29 million psi., are ideal for use in such structural components particularly when either corrosion or heat resistance is also needed. The chart above shows the elastic modulus of materials sometimes considered for such applications.

Better corrosion resistance



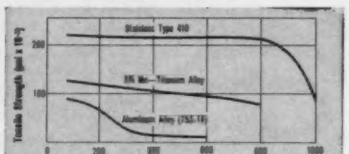
A good example of Carpenter Stainless resistance to corrosion. The nozzles used to fill storage batteries with electrolyte were formerly made from hard rubber. These rubber nozzles did not corrode, but they broke frequently, and proved costly to replace. After switching to Carpenter Stainless No. 20Cb, all problems were solved. No breakage . . . no corrosion . . . more production per shift. The perfect choice of material for this highly corrosive application.

Increased productivity



Big results in miniature . . . with Carpenter Mel-Trol® Stainless No. 440-C. Ten of these miniature precision bearings laid side by side measure only one inch in length! A miracle in close tolerance machining was required to fabricate the race and ball retainers for these bearings. Since a change to Carpenter Mel-Trol No. 440-C, this manufacturer has realized a 200% increase in production. A big improvement for a small item.

Elevated temperature properties



Much of the newer industrial and military equipment is being designed for service at temperatures higher than ambient but not high enough to justify the use of the special high temperature alloys, for example, the maximum operating temperatures of 400 to 800°F. Alloys other than stainless steels have been considered for such applications but from both an economic standpoint and the stress requirements, one of the stainless steels is usually found to be the best selection as indicated in the chart above.

Application engineering service

To help improve stainless steel performance on almost every application, Carpenter has placed in the field this extra service for all its customers. Armed with skill and technical know-how, each Carpenter Representative is available for ideas and suggestions to improve the products you are contemplating. His vast knowledge of new products, plus application guidance and practical assistance can be of great help to you. Get in touch with the Carpenter Representative nearest you. You'll find him a good man to have on your team.

Additional help

Space does not permit a complete listing of description and application suggestions for all grades of Carpenter Stainless Steels. For detailed information on all grades of Carpenter Stainless, write today for the Technical Data Sheets available upon request.

Are you getting all these performance characteristics in the materials you specify?

- ☐ *brilliant finish*
- ☐ *maximum strength*
- ☐ *corrosion resistance*
- ☐ *uniformity*
- ☐ *hardness*
- ☐ *versatility*
- ☐ *good machinability*
- ☐ *ease of fabrication*
- ☐ *exacting tolerances*
- ☐ *long service life*
- ☐ *customer satisfaction*

Carpenter Stainless gives you *all* these . . . and more!

Carpenter steel

you can do it ***consistently*** better with Carpenter Stainless Steels for specialists

The Carpenter Steel Company, Main Office and Mills, Reading, Pa.
Alloy Tube Division, Union, N. J.
Webb Wire Division, New Brunswick, N. J.
Carpenter Steel of New England, Inc., Bridgeport, Conn.

Circle 81 on Reader-Service Card for more information

NEW LITERATURE

Production Parts Manual 451

This handy, 17-page manual was prepared for the convenience of design engineers and contains specifications on such products as: adapter couplings, bushings, elbows, tees, hose assemblies and brackets. A fold-out page shows diagrammatic views of "Dryseal" pipe threads and relationships of the different types. Methods of pipe thread gaging are given as well as definitions of series symbols, differences in pipe threads and standard gaging practice for various pipe threads. Lincoln Engineering Co., Original Equipment Sales Div., 4010 Goodfellow Blvd., St. Louis 20, Mo.

Precision Resistor Wire Calculator 452

A pocket-sized graphic calculator provides a convenient means of determining megohms-per-lb and cost-per-megohm of enameled 800-ohm nickel-chromium and 815-ohm iron-chromium-aluminum precision resistor wire. The handy slide chart covers wire sizes ranging from 0.0031 inch down to and including 0.0004-inch dia. Comparative data on wire having a temperature coefficient of resistance of ±10 ppm per deg C over the operating range from −65 to 150C are given on the front of the calculator, while wire with a temperature coefficient of ±20 ppm is presented on the back. Hoskins Mfg. Co., 4445 Lawton Ave., Detroit 8, Mich.

Electrical and Mechanical Products 453

A 36-page, pocket-sized catalog includes specifications and descriptive information on wiring devices, fuse specialties, fastening devices and masonry drills. Covered are self-drilling anchors, plastic screw anchor kit, "Tru-Start" core drills, "Tripl-Flute" percussion drills, machine screws, hex nuts, washers, "Two-Hole" snap-straps, copper tube drive-straps, "All-Steel" wire stripper and polypropylene plastic clamps. Holub Industries, Inc., Sycamore, Ill.

Glass Polyester Selection Guide 454

A guide for water-resistant, glass-mat laminates and molding compounds for Class B insulation applications. The eight page brochure (B8216) emphasizes such features as low water absorption, light weight, economy, flame retardance, and arc and track resistance for reliability in contaminated atmospheres. Physical and electrical properties of 10 grades of glass-mat laminates and three grades of glass molding compounds (with low, medium and high impact qualities) are given. Westinghouse Electric Corp., Micarta Div., Hampton, S. C.

To obtain copies of numbered literature . . . circle appropriate number on Reader Service card.

Rate and Acceleration Nomograph 455

Particularly useful for rate gyros and angular accelerometers, this nomograph makes possible rapid determination of rate in deg/sec and acceleration in deg/sec² when the frequency in cps and displacement in degrees are known. Micro Gee Products, Inc., Dept. NOM, P. O. Box 1005, Culver City, Calif.

Metal Bellows 456

Presents extensive design and application data concerning welded-diaphragm bellows. The brochure is organized under eight section headings, providing a concise story of bellows design and applications. Metal Bellows Corp., 3037 Mica Lane, Wellesley Hills 82, Mass.

Stainless-Steel Tubing 457

A 20-page catalog and price book for "300" series stainless-steel tubular products. Incorporated in the booklet are a comprehensive price chart, basic requirements, price references and sample computations. Sizes, grades and types are listed, and technical data on chemical requirements and chemical analysis are provided. The booklet also illustrates plant and manufacturing processes, equipment and testing facilities. Sumitomo Shoji New York, Inc., Tubular Products Div., 149 Broadway, New York 6, N. Y.

Industrial Fasteners 458

An information-packed review of specification information on "Flexloc" "Sel-Lok" and "Hallowell" lines. Bulletin not only details basic data on types, sizes, threads and plating, but also illustrates design features and application information as well. Fast-reading specification information on materials, threads and size ranges is contained in a series of tables, each supplemented by sketches identifying type of fastener. Standard Pressed Steel Co., Box 778, Jenkintown, Pa.

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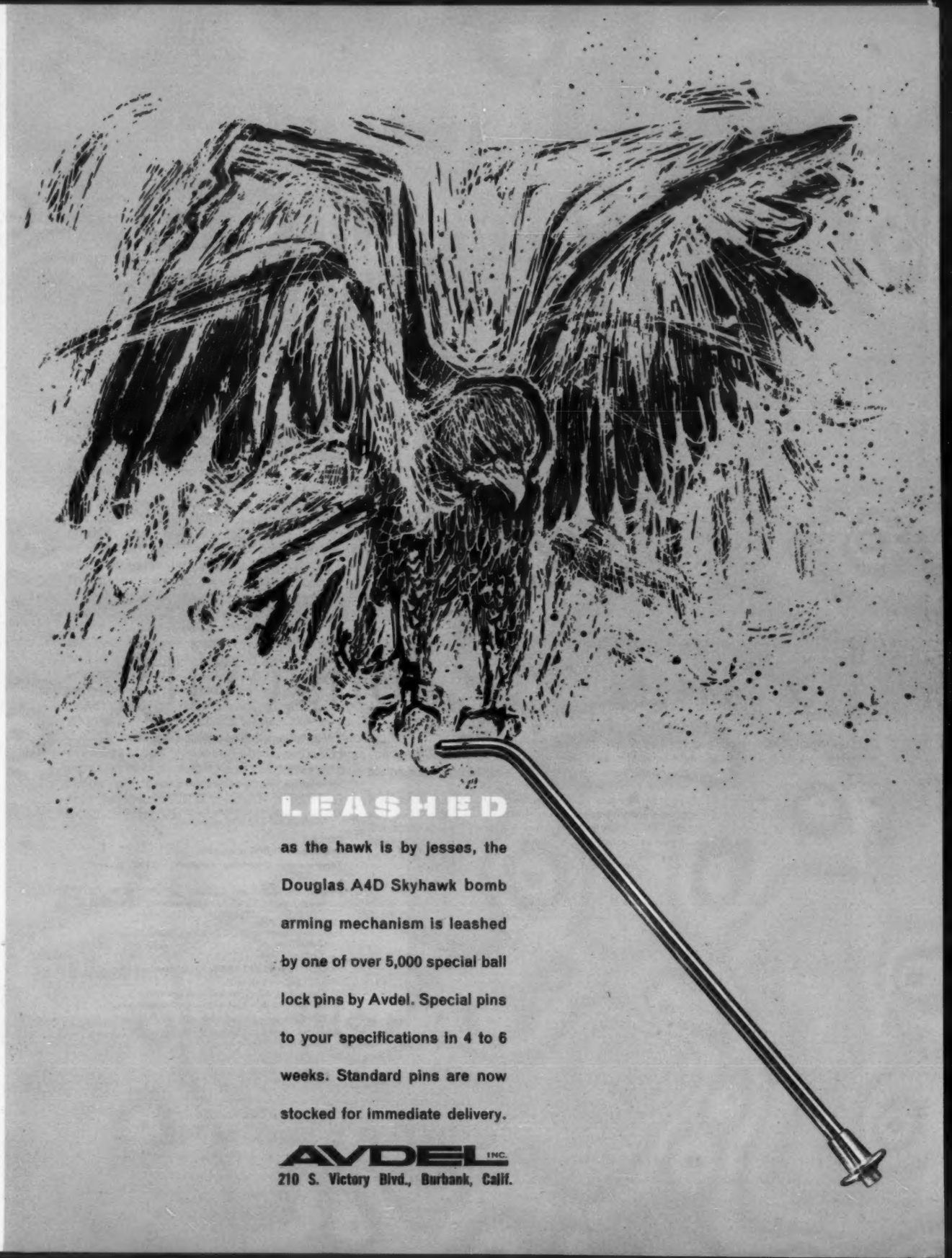

LEASHED
as the hawk is by jesses, the Douglas A4D Skyhawk bomb arming mechanism is leashed by one of over 5,000 special ball lock pins by Avdel. Special pins to your specifications in 4 to 6 weeks. Standard pins are now stocked for immediate delivery.
AVDEL INC.
210 S. Victory Blvd., Burbank, Calif.

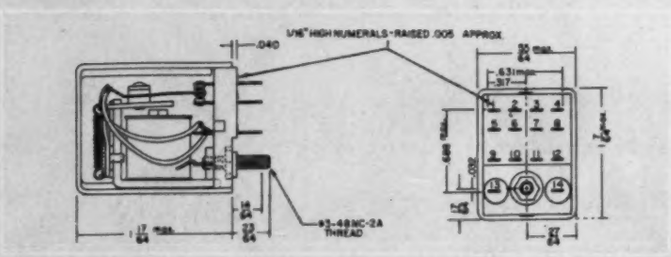
a New and important P&B relay . . .

KHP SERIES SHOWN ACTUAL SIZE

having rare longevity

This small, 4-pole relay has the happy faculty of maintaining its original operating tolerances over an exceptionally long life. Example: tests (by customers!) show this relay has variations in electrical characteristics of less than 5% after more than 100 million operations.

But that's far from all. This is a *small* relay . . . about a one inch cube. This relay is easy to install using the conveniently spaced solder lugs or a socket. Thus you save time and production costs. This relay is versatile . . . its 4PDT contacts will switch loads from dry circuit up to 3 amperes. This relay—well, why not order samples and see for yourself! Order today from your P&B representative or call us at Fulton 5-5251, in Princeton, Indiana.



KHP SERIES SPECIFICATIONS

CONTACTS:
Arrangement: 4 Form C, 2 Form Z.

Material: 1/8" dia. Silver standard. Silver cadmium oxide and gold alloy available.

Rating: 3 amps @ 30 volts DC or 115 volts AC resistive for 100,000 operations.

COILS:
Resistance: 11,000 ohms max.

Temperature: Operating Ambient: —45°C. to +70°C.

Power: 0.5 watts min operate @ 25°C. 0.9 watts nom. @ 25°C. 2.0 watts max. @ 25°C.

TIMING VALUES:

Nominal Voltage @ 25°C.	Max. Values
Pull-in time	15 ms
Drop-out time	5 ms

INSULATION RESISTANCE: 1500 megohms min.

DIELECTRIC STRENGTH:
500 Volts RMS 60 cycles between contacts.
1000 Volts RMS 60 cycles between other elements.

MECH. LIFE: In excess of 100 million cycles.

SOCKET: Solder lug or printed circuit terminals. Available as accessory.

DUST COVER: Standard.

TERMINALS: Solder lug and taper tab.

P&B STANDARD RELAYS ARE AVAILABLE AT YOUR LOCAL ELECTRONIC PARTS DISTRIBUTOR

POTTER & BRUMFIELD

DIVISION OF AMERICAN MACHINE & FOUNDRY COMPANY • PRINCETON, INDIANA

IN CANADA: POTTER & BRUMFIELD, DIVISION OF AMF CANADA LIMITED, GUELPH, ONTARIO

LITERATURE

Spring-Tension Fastening Devices 459

Summarizes in four pages the various classes of spring-tension fasteners. Illustrates customized designs for clamps, clips, latches and locks, pins, retainers, snap rings, hooks and holders, catches, spring washers, hangers and collars. Case-history examples demonstrate how spring-like flat stampings can simplify design, cut costs and improve reliability. Technical assistance is offered in design, development and production of custom fasteners engineered to perform a multiplicity of functions. Associated Spring Corp., Bristol, Conn.

Miniature Replaceable Lamps 460

Miniature display lights which use standard replaceable-from-front indicator lamps are described in this one-page pamphlet. Mounting dimensions are illustrated. Transistor Electronics Corp., 3357 Republic Ave., Minneapolis 26, Minn.

Precision Counters 461

Internal pinion counters for navigational and directional systems are described and illustrated in a data sheet. Specifications and dimensions are given as well as a description of the way in which these counters combine minimum size with maximum readability. Illustrative material includes a photograph and engineering drawings. The data sheet is punched for ready insertion in loose-leaf binders. Veeder-Root Inc., 70 Sargeant St., Hartford 2, Conn.

Hydrogen Thyratrons: Theory and Application 462

A comprehensive discussion of thyratrons is contained in Bulletin PT-49. General theory and application of hydrogen thyratrons are discussed, with specific reference made to three different tubes for data and ratings. Schematics, graphs and charts detail construction, operation, applications and characteristics of thyratrons. General Electric Co., Schenectady 5, N. Y.

Circle 83 on Reader-Service Card

Socket Adapters 463

A total of 42 different varieties of socket adapters for testing of solder-terminal components such as relays, transformers and other items is described in a 12-page catalog. Electronic Engineering Co., 1601 E. Chestnut Ave., Santa Ana, Calif.

Plastic Properties Table 464

Shows significant physical, electrical, chemical and optical properties of nine thermoplastic materials. Materials covered are acrylics, acetate, butyrate, "Teflon" and "Kel-F" fluorocarbons, nylon, polyethylene and vinyls. Data is compiled from test reports submitted by manufacturers. Properties shown include: tensile, impact, flexural and compressive strength; resistance to sunlight, water, weak and stong acids and alkalies; dielectric short-time strengths and constants; power factors; machining qualities, hardness, flexibility, and thermal properties. Cadillac Plastic & Chemical Co., 15111 Second Ave., Detroit 3, Mich.

Push Inserts 465

How the push-type insert is used to form strong threads in plastics after molding is described in bulletin 777. The bulletin explains how the insert solves problem of providing inexpensive, strong threads in molded-plastic parts without molding insert into part. A table lists sizes (from 4-40 through 12-24 inches, in copper-clad steel and red brass), dimensions of each size and quantity prices. Heli-Coil Corp., Danbury, Conn.

Miniature Fuse Posts 466

This catalog sheet illustrates, describes and gives full technical specifications of military-approved 3AG miniature fuse posts that offer any combination of fluted or knurled knobs with straight and right-angle bottom terminals. Littelfuse, Inc., 1865 Miner St., Des Plaines, Ill.

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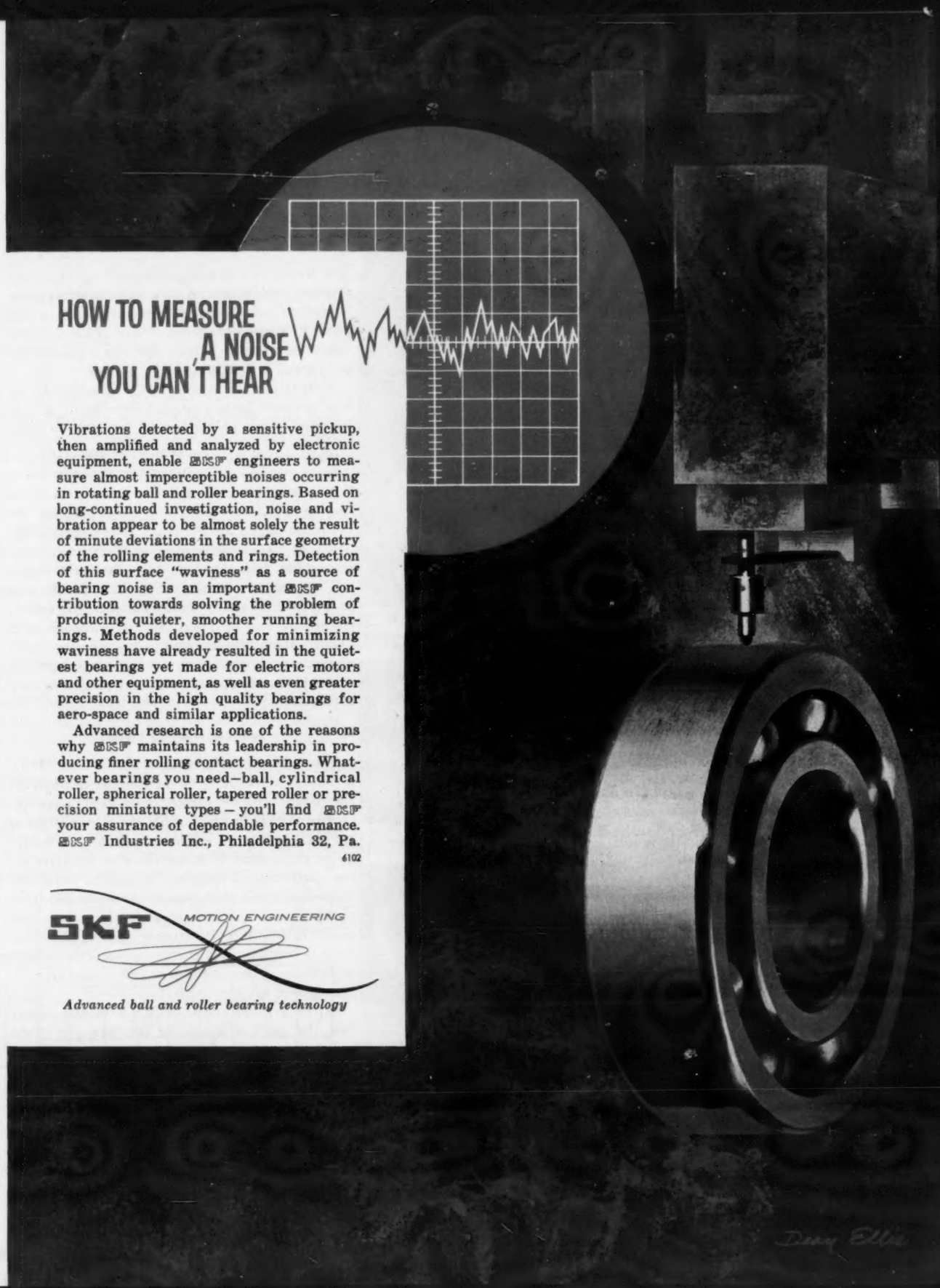

HOW TO MEASURE A NOISE YOU CAN'T HEAR

Vibrations detected by a sensitive pickup, then amplified and analyzed by electronic equipment, enable SKF engineers to measure almost imperceptible noises occurring in rotating ball and roller bearings. Based on long-continued investigation, noise and vibration appear to be almost solely the result of minute deviations in the surface geometry of the rolling elements and rings. Detection of this surface "waviness" as a source of bearing noise is an important SKF contribution towards solving the problem of producing quieter, smoother running bearings. Methods developed for minimizing waviness have already resulted in the quietest bearings yet made for electric motors and other equipment, as well as even greater precision in the high quality bearings for aero-space and similar applications.

Advanced research is one of the reasons why SKF maintains its leadership in producing finer rolling contact bearings. Whatever bearings you need—ball, cylindrical roller, spherical roller, tapered roller or precision miniature types – you'll find SKF your assurance of dependable performance. SKF Industries Inc., Philadelphia 32, Pa.

6102

SKF MOTION ENGINEERING

Advanced ball and roller bearing technology

Why "MARK-TIME" MECHANICAL TIMERS should be INVESTIGATED!

Low cost mechanical Timers, Time Switches and Time Devices **can** be quite sophisticated. For example: they can be designed to ring bells, flash lights, turn valves, cut cords, start, stop or operate electrical or mechanical equipment, and to do all this **after** a pre-selected time period has elapsed.

The "Mark-Time" mechanical "memory" **cannot** fail due to an electrical failure since it is spring powered.

The "HEART" of the "Mark-Time" is of a new super-tough alloy which prolongs mainspring life indefinitely.

This new special steel virtually **eliminates** mainspring failure. This adds extra sales features to your product at no extra cost.

The "MARK-TIME" Mainspring is Unbreakable!

Tensile strength, durability and corrosive resistance is unexcelled. No other Timer on the market has these exclusive features.

At present, we manufacture more than 3,000 DIFFERENT kinds of custom-built timers for industrial, consumer and military applications. Thus, we are the **largest** manufacturer of mechanical timers in the **world**!

Research and development work welcome—small runs our specialty.

Sales engineers in 27 key cities at **your** service.

Write for your copy of this **new** Engineering Handbook on Timers, specifically written and illustrated for the Design and Development Engineer.

MARK-TIME **M. H. RHODES, inc.**
HARTFORD 6, CONNECTICUT

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TECHNICAL PAPERS

Wear Limits for Roller And Silent Chain Drives

H. S. Germond, Morse Chain Co., Ithaca, N. Y.

The useful life of most roller and silent chains depends on wear. A chain which appears "stretched" or elongated is merely worn at the joints by many flexures in service. This so-called wear elongation is usually stated as a percentage of original or new length.

Two factors affect wear life, i.e., wear rate, or how fast wear progresses, and wear limit, or how far wear can go before failure. In equation form

$$\text{Wear life (hours)} = \frac{\text{wear limit (percent)}}{\text{wear rate (percent/hr)}}$$

For longest wear life, the wear rate must be as small and the wear limit as large as possible. To minimize wear rate, the designer can specify the best lubrication and protection from contamination. After that, wear rate depends on the user.

There is an ultimate wear limit which is a property of the chain itself. Most precision roller-chain pins and bushings are case-hardened to a depth which allows about 3½ percent wear elongation. After that, the softer core materials of the joint are exposed, and wear progresses very rapidly.

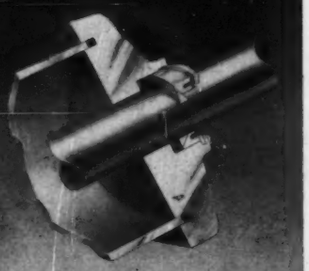
Sprocket-Wrap Limit

One limit to the amount of useful wear life of a chain is determined by the number of teeth on the large sprocket. Since chain-joint wear increases the chain pitch while the sprocket pitch remains the same, a mismatch will develop as the chain joints wear. If at one place on the sprocket the chain meshes perfectly, at another place the worn chain will mesh poorly or not at all. Poor meshing usually occurs at the place where the slack chain enters the large sprocket. The wear limit is reached when the mismatch is about half a pitch and the chain tries to climb over or "jump" the sprocket teeth.

When a roller chain elongates to the extent that the pitch diameter of the wrapped chain equals the outside diameter of the sprocket, the chain is no longer fit for use. Using ASA roller-chain sprocket dimensions, the wear limit in percent works out to about 183/N, where N is the number of teeth in the sprocket.

Another criterion (for roller chain) assumes that the wear limit occurs when the pitch diameter of the worn chain exceeds that of the sprocket by an amount equal to one roller diameter. For

Packs more PERFORMANCE into less space



THE NEW PALMETTO D-W SEAL
Patents Issued and Applied For

Palmetto offers a compact, low-cost rod seal which matches the performance of the best grades of bulkier packings. You save significantly on machining costs . . . packing cost is reduced . . . sealing action is sure, unusually long-lived.

- **POSITIVE SEAL . . . NO "SPIRALING"**—with stable D-ring
- **CANNOT EXTRUDE**—nylon wedge rings extend with double cam action, protect D-ring at rod and heel
- **ADDED SECURITY**—double wedge rings form secondary seal
- **INCLUDES SCRAPER-WIPER**—lip on outer wedge is integral wiper
- **FITS SIMPLE COUNTER-BORE IN CYLINDER HEAD**—is secured with snap ring

See how the D-W Seal provides important advantages for the equipment you are designing. Write for details, now.

PALMETTO PACKINGS

GREENE, TWEED & CO.
OUR 99TH YEAR
NORTH WALES, PA.

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WATERMAN

Series 1617

D.C. 4-WAY
SOLENOID VALVES

High pressure
Low leakage
No dynamic seals

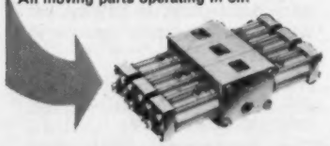
Complete range of types—closed-center, tandem, two-position configurations, etc.

3000 p.s.i. pressure—rated pressure may be applied to all ports.

Operate solenoids without flow or pressure.

Light and compact—weighs only 5 pounds complete.

All moving parts operating in oil.



Simple stacking or banking of any number of valves with standard kits. Allows you to add on later.

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W-6110

WATERMAN

725 Custer Ave., Evanston, Ill.

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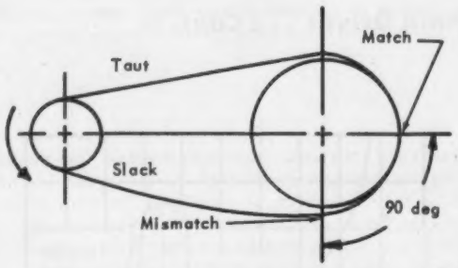


SPIRAL PATTERN
OF CHAIN SEEN WITH STROBOSCOPE

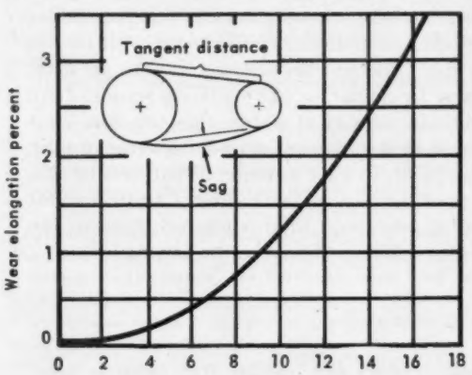
most ASA roller chains this wear limit works out to about 196/N percent.

Case Clearance Limit

Chain-guard or case clearance sometimes restricts the useful wear life of a chain. This happens as normal wear-induced slack collects at the slack or unloaded strand. When clearance is limiting, wear-induced slack eventually becomes large enough for the chain to strike the case, damaging both case and chain.

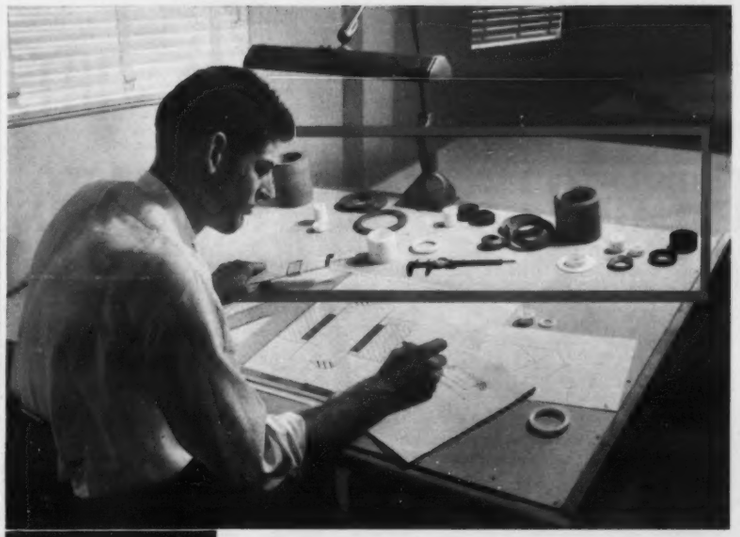
The catenary arc of the slack chain span is longer than the chord or tangent distance by the amount of wear elongation in both taut and slack spans and the elastic stretch of the taut span caused by the working chain pull (about 0.1 percent).

The case clearance limit has several practical uses. First, it points out that center-distance adjustment is not always necessary for maximum wear life, provided there is enough case clearance. This is usually true of drives with shaft centers not steeply inclined or where backlash is not objectionable. Avoiding center adjustment eliminates one maintenance cost item. Where backlash is objectionable, centers are nearly vertical or slack chain is in the upper span, adjustment becomes more important. Designing with limited case clearance is one way to obtain an automatic warning that some other wear limit is near.



CASE CLEARANCE WEAR LIMIT

(Continued on next page)



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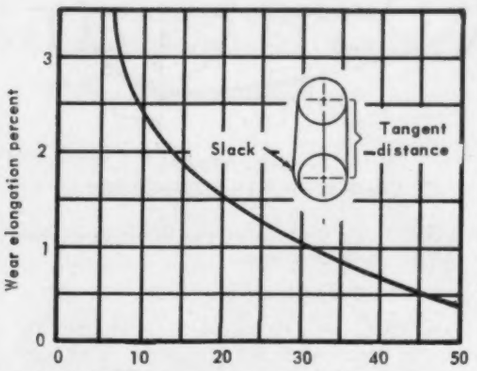
Chain Drives . . . Cont.



VERTICAL DRIVE WEAR LIMIT

Vertical Drive Limit

Useful wear life may be limited severely if the slack strand of a chain drive is nearly vertical. When the upper sprocket is driving and the slack strand is falling, wear elongation tends to "collect" where the slack strand engages the lower sprocket. As wear progresses, the accumulated slack tends to hang free of the lower sprocket, partially unwrapping it so that a mismatch occurs between chain and sprocket teeth. When the mismatch approaches half a chain pitch, the chain may jump a sprocket tooth.

When the lower sprocket is driving and the unloaded or slack strand is rising, the vertical-drive condition would seem to be less critical. Field experience with higher speed vertical drives indicates this condition is usually just as critical and predictable as with the upper sprocket driving.

The designer of a vertical drive can get the longest wear life by using the largest chain pitch practicable and keeping shaft-center distance short. To raise this wear limit he may provide for periodic center-distance adjustment or, if centers are fixed, use an idler sprocket to take up slack. Where he cannot avoid an adverse vertical drive condition, he can at least weigh the wear-limit penalty against the cost of center distance or idler adjustment. In some instances he will only be able to raise the vertical-drive limit a small amount until another wear limit is reached. Even so, the increased life may be worth the expense.

Abstracted from a paper entitled "Wear Limits for Roller and Silent Chain Drives"; ASME No. 60-WA-8; $1; to ASME members, $.50. The American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.

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Copies of these papers may be obtained by writing to technical society indicated. Addresses follow last item.

PROPOSED SYMBOLOGY FOR DIGITAL SYSTEMS; *An Ad Hoc Group of AIEE Computing Devices Committee; AIEE No. 60-1224; $1; to AIEE members, $.50.*

Suggested symbols for design and maintenance requirements of digital systems: algebraic symbols for representing variables and connectives used in logical expressions, graphical symbols for manually prepared logical diagrams and printed graphical symbols for logical diagrams prepared by high-speed printers.

MISSILE AND SPACE VEHICLE NON-PROPULSIVE POWER CONCEPTS; *D. K. Breaux, W. L. Burriss and R. L. Schultz AiResearch Mfg. Co., Div. of The Garrett Corp., Los Angeles, Calif.; SAE No. 234A; $.75; to SAE members, $.50.*

Non-propulsive power is considered, including both power generation and ultimate dissipation. Simultaneous consideration of power generating and heat sink requirements has important consequences in selecting energy source and conversion equipment.

SYNCHRONIZATION OF CONVEYOR DRIVES; *Jervis C. Webb, Jervis B. Webb Co., Detroit, Mich.; ASME No. 60-WA-223; $1; to ASME members, $.50.*

Synchronization of conveyor drives is a means of continuous processing, amounting to controlled or self-regulated flow of work from one conveyor or machine to another, until the work is completed. Consideration is given to synchronization of drives on independent conveyors, assuming each conveyor has only one drive.

COMBATING CORROSION WITH BUTYRATE PIPE; *W. P. Gideon and R. O. Hill, Jr., Eastman Chemical Products, Inc., Kingsport, Tenn.; presented at the Regional Technical Conference sponsored by Golden Gate Section, Society of Plastics Engineers, Inc., San Francisco, Calif.*

Tenite butyrate plastic does not rust and is resistant to most common corrosive agents. Pipe made from this material is of service in nonpotable water lines, oil lines, electrical conduit and natural gas lines. Such pipe is cut easily and joined with the use of butyrate-base cement. Use of transparent butyrate pipe with colored cement allows visual inspection of a cemented joint.

SNAP 2 RADIATIVE–CONDENSER DESIGN; *M. G. Coombs and R. A. Stone, Atomics International, Div. of North American Aviation, Canoga Park, Calif.; ARS No. 1328-60.*

Design of a minimum-weight radiative condenser for Snap 2 requires simultaneous consideration of two-phase mercury flow, a variety of heat transfer problems, meteoroid protection and radiator geometry effects. Interactions between these problem areas and the method by which this condenser was designed are described.

American Institute of Electrical Engineers, 33 W. 39th St., New York 18, N. Y.
American Rocket Society, 500 Fifth Ave., New York 36, N. Y.
The American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.
Society of Automotive Engineers, Inc., 485 Lexington Ave., New York 17, N. Y.
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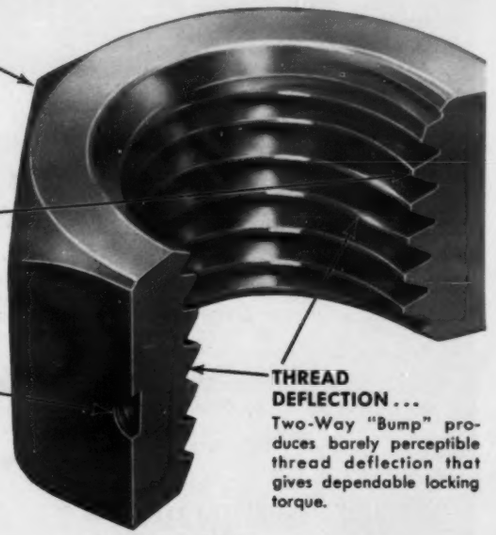

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DESIGN IDEAS NEWS

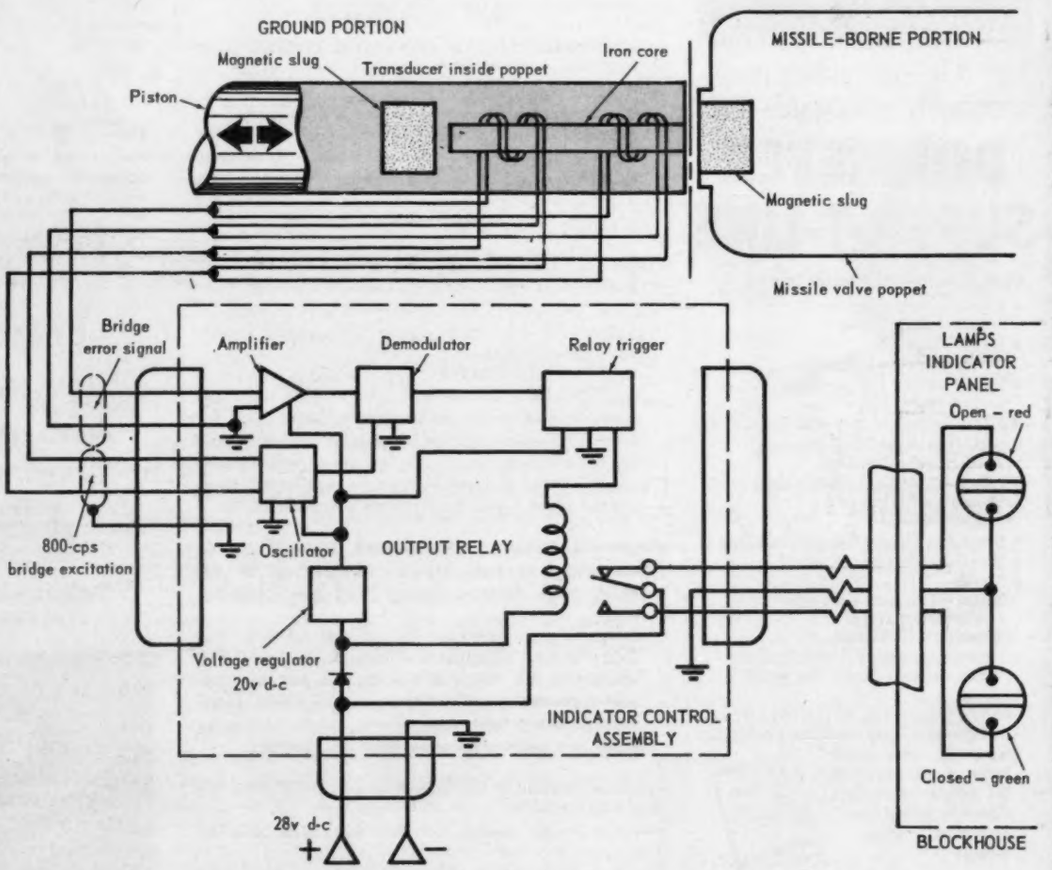
DESIGN IDEAS NEWS — CONTROLS

Variable-Reluctance Transducer Signals Valve Position

Edward W. Schrader, Western Editor

A variable-reluctance transducer combines with an electronic indicator-control assembly to provide a remote signal of valve position to the blockhouse. This remote position-indicating device is used on the fill valves for liquid oxygen and liquid hydrogen in the Atlas-Centaur program. Temperature differentials in the fueling area range between —450 and +110F. Limit switches to sense valve position were ruled out because of the lack of lubrication and because operation is required in the presence of volatile fuels.

The fueling system in the Atlas-Centaur consists of an intake poppet valve on the missile frame. The poppet is kept in the normally closed position by



VALVE-CLOSURE SYSTEM consists of magnetic slug, transducer assembly and indicator-control assembly. Magnetic slug is part of missile-borne valve. Transducer mounts on ground side of propellant fill valve. Variable-reluctance transducer senses distance between magnetic slug and end of transducer, and produces electrical output that is function of distance. Indicator-control assembly measures electrical output of transducer. At one voltage level, relay is energized; at lower voltage level, relay is de-energized. Relay contacts energize red or green light in blockhouse.

INDICATOR-CONTROL ASSEMBLY consists of d-c voltage regulator, 800-cps oscillator, amplifier, demodulator and Schmitt trigger circuit. Unit is completely transistorized. Transducer is 14 inches long. System is accurate to 0.0025 inch.

a compression spring. On the ground side of the fueling system, there is a second poppet valve, facing the airborne valve on the missile frame. Dry helium in a pneumatic cylinder actuates the ground poppet.

The variable-reluctance transducer lies in the hollow core of the piston. As the piston extends, it drives the poppet valve open on the ground side of the system. Movement of the piston against the airborne poppet opens the check valve, thus allowing fuel to flow into the missile.

The electrical bridge circuit in the transducer senses valve position. With the piston fully retracted, the bridge is unbalanced. As the piston moves toward the check valve, the permeable, stainless-steel slug in the poppet varies the reluctance. The bridge balances as the gap closes. Thus, the bridge gives two different voltage levels for either position. The bridge is initially unbalanced in the valve-open position by means of a second slug. This slug is positioned in the transducer aft of the bridge. The bridge coils are connected in series, wound about the transducer core.

The transducer furnishes two readouts—safely closed and completely open. When fueling is completed, the reverse takes place. As the piston slowly retracts, readout indicates the position of the missile poppet valve—open or fully seated. Accessory lights showing safe or unsafe condition provide the visual indication in the blockhouse.

The reluctance transducer and electronic indicator control assembly are design developments of Crescent Engineering & Research Co., El Monte, Calif. They were designed as components of the propellant fill and drain valve of Convair (Astronautics) Div. of General Dynamics Corp., San Diego, Calif.

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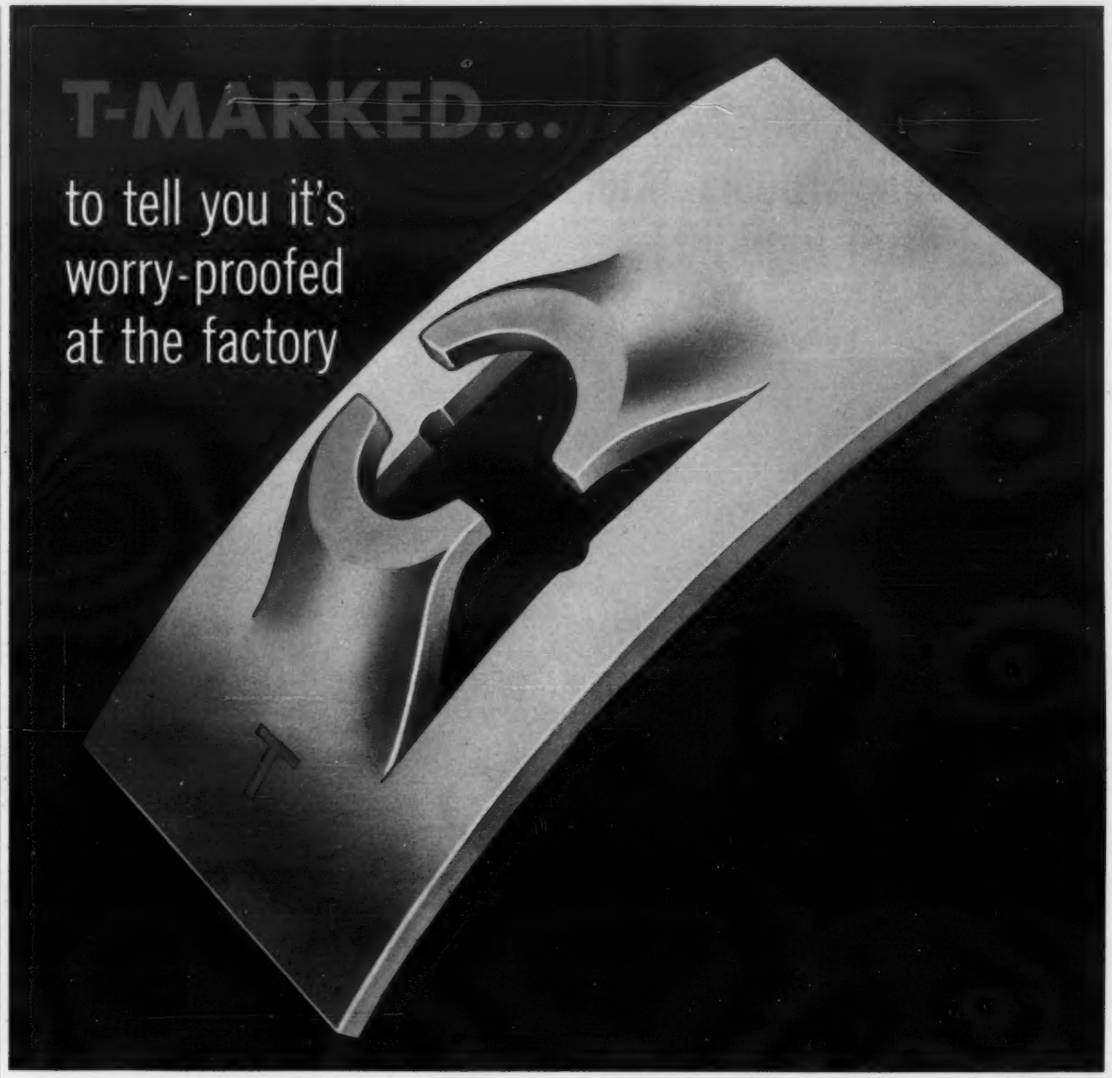

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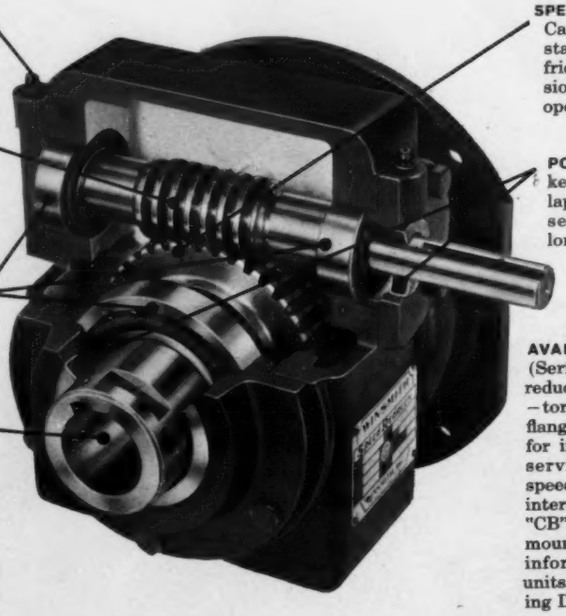

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POSITIVE OIL SEALS keep oil in, dirt out. Shafts lapped to micro-finish under seals for uniform contact, longer seal life.

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Light enough to meet airborne requirements, the tractor can perform the work of heavy earth-moving equipment by means of a self-loading ballast bowl or compartment. The front-loading bowl can be filled with dirt, or other available ballast, thereby doubling the weight of the vehicle and providing a maximum drawbar pull of 17½ tons. The bowl also has a hydraulically operated "gate" that serves as an ejector, which permits the machine, as a scraper, to spread its load "on the go" or to dump it over an embankment.

The tractor is powered by a 250-hp, V8, liquid-cooled gasoline engine located at the rear of the vehicle. Controls also are located in the rear to give the operator an unobstructed forward view of the bowl during scraper-loading operations.

A unique feature is a hydropneumatic suspension system controlled by the operator. In a solid or unsprung state, the suspension system permits the machine to perform earthmoving and other similar functions, but in a sprung state the tractor can run smoothly on and off the highway at convoy speeds. The crawler tracks will propel it across rivers and lakes at a speed of four mph.

The experimental model was built by International Harvester Co., under a contract with the U. S. Army Engineer Research and Development Laboratories, Ft. Belvoir, Va.

• **FIRST WORKING MODEL** of a high-capacity, solid-state electronic device for converting d-c to a-c has been designed and successfully tested by General Electric's General Engineering Laboratory. The device has no moving parts, other than two fans, and it does the work of a 60-hp motor-generator set. With a rating of 50 kva, the inverter has 10 times the power-handling capacity of units of this type previously announced.

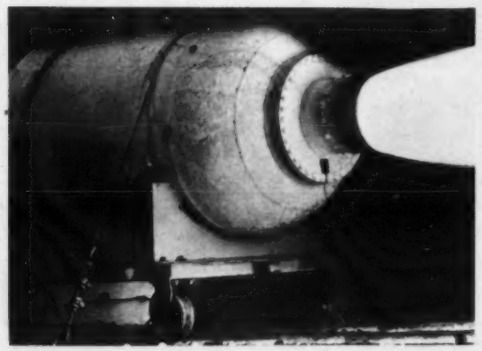
Actual conversion of power from d-c to a-c is accomplished by silicon-controlled rectifiers which operate instantaneously and require no warm-up. The unit consists of two 12-phase bridge inverters. Output voltages of each of these inverters can be varied in phase, with respect to one another, to control the total output voltage.

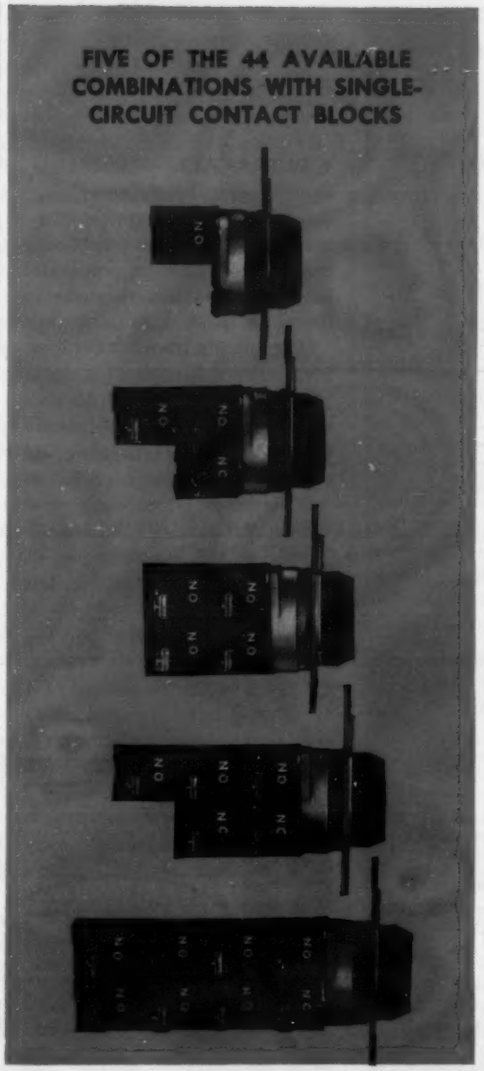
Output frequency is determined by a unijunction oscillator which fixes the inverter's gating rate. A-C power output is provided in frequencies varying from 50 to 500 cycles. Anticipated overall efficiency of the inverter is 80 percent plus. Efficiency of the silicon-controlled rectifier element is expected to exceed 95 percent.

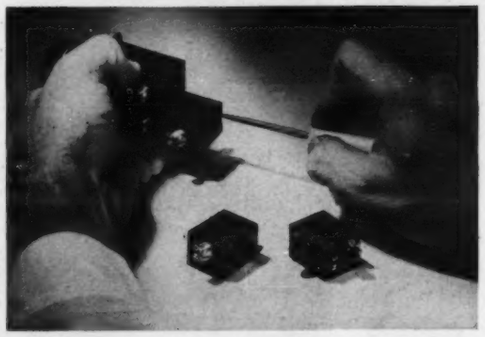
• **SUCCESSFUL TEST FIRING** at —75F of a rocket motor containing approximately 3500 lb of an advanced new solid propellant ("Flexadyne") has been announced by Rocketdyne, Div. of North American Aviation, Inc. The big research motor, measuring 38 inches in dia and 7 ft in length, is believed to be the largest solid-propellant rocket motor cycled and fired at such low temperatures.

Propellant used was based on an advanced polybutadiene fuel-binder which has demonstrated superior physical properties. The binder gives the propellant resistance to cracking or tiring at extremely low temperatures.

Successful testing of the unit also is significant because of the relative thickness of the propellant web. Web fraction of more than 50 percent is one factor indicating the suitability of Flexadyne propellants for very large solid-propellant rocket motors in the 1- to 2-million-lb thrust class.



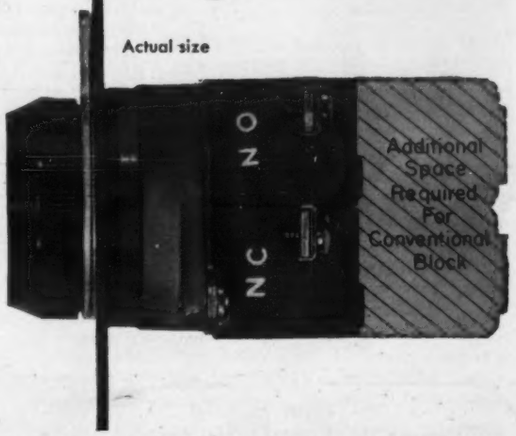




EASY INSTALLATION on a standard operator is possible because blocks are interchangeable. Two captive screws fit into internally threaded screwheads of previous unit to hold block assemblies securely.

NEW

Shallow Contact Blocks for General Electric Heavy Duty Oil-tight Push Buttons



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- **CONTROL UP TO 8 CIRCUITS IN ANY COMBINATION OF NO-NC**
- **SAVE BACK-OF-PANEL SPACE**

It is no longer necessary to pay for unused circuits in oil-tight push buttons. And you are no longer limited to a maximum of four normally open—four normally closed circuits.

General Electric's new shallow contact block offers you the savings and flexibility of "single-circuit" design. Separate normally open and normally closed blocks are available and up to eight blocks may be mounted with a standard operator. You can buy only the circuits you need in *any* combination—even eight NO or eight NC.

Nearly one inch shorter than conventional contact blocks, the new shallow block saves important back-of-panel space. Four blocks (four separate circuits) take up no more back-of-panel depth than a conventional two-circuit block.

Shallow contact blocks are designed for use with standard General Electric oil-tight operators. Since the new block is offered in addition to G.E.'s standard block, and is interchangeable with it, you now get even greater flexibility with the G-E oil-tight push-button line.

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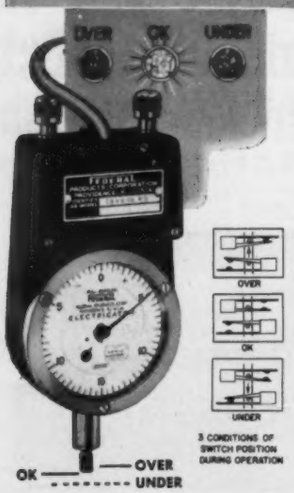
GAGE PAGE

A Quick Run-down of New Gaging Ideas



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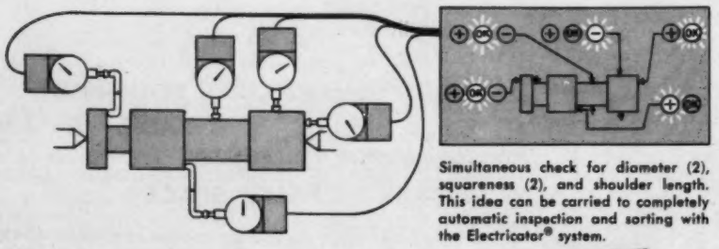

Simultaneous check for diameter (2), squareness (2), and shoulder length. This idea can be carried to completely automatic inspection and sorting with the Electricator® system.

For complete specs, dimensions — the *whole* story — send for Catalog 60 AM.

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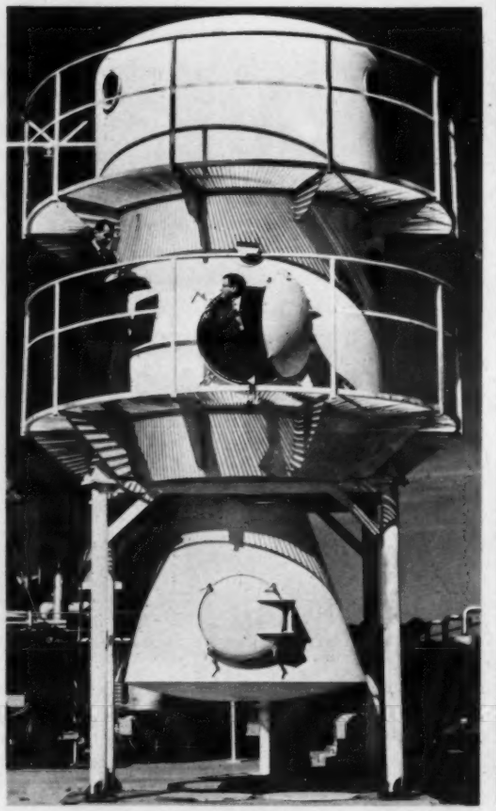
RELEASES

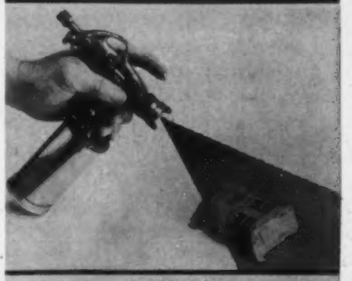
• **FULL-SCALE, WORKING MODEL** of a three-man space station provides a testbed for developing the life-support systems that astronauts will need in space—air conditioning, water regeneration, storage and preparation of food. The model will be able to duplicate every situation found in space except the absence of gravity.

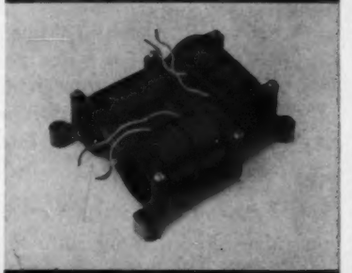
The space station is 24 ft long and 10 ft in dia. It contains three rooms—a working compartment, a living compartment and a dual-purpose capsule that would serve as a bedroom in space but would be the crew's cockpit during launch and eventual return to earth.

The model is nearing completion at the Convair (Astronautics) Div. of General Dynamics Corp. Convair engineers say that such a station could be perfected and launched into orbit with the Atlas-Centaur space booster by 1963. It would bridge the gap between short-trip one- or two-man capsules and spacecraft making extended flights.



Electrofilm





SPRAYED-ON HEATING ELEMENTS

Electrofilm's sprayed on — film type heating elements are especially designed for hard to heat contour surfaces. The element can be applied directly to the part . . . or to detachable components.

- **LIGHT WEIGHT** .07 lbs./sq. ft.
- **THIN** .011" to .015" (approx.)
- **ENVIRONMENT** Meets mil E-5272-A Spec.

Write for detailed technical data.

Electrofilm INC.
P.O. BOX 106, NORTH HOLLYWOOD, CALIF.

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QUESTIONS ANSWERS

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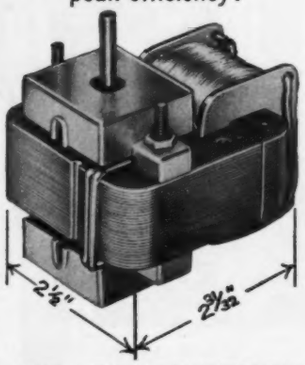
SMOOTH POWER

AC MOTOR

with extra large lubricant reservoirs for long range peak efficiency!



MODEL "H" 2-Pole, Shaded-Pole Motor 1/550 to 1/90 H.P., designed and constructed with features that assure thousands of extra hours of service under the most adverse operating conditions.

OIL CAPACITY MANY TIMES GREATER THAN CONVENTIONAL MOTORS

Oversized oil bearing reservoirs hold considerably more oil and wicking. A revolutionary new method of packing the wicking assures equal distribution of oil at all times resulting in quieter operation and longer trouble-free life.

DIE-CAST BEARING BRACKET

The new "H" motor design includes a rugged die-cast bearing bracket that insures permanent precision alignment and adds to the over-all durability.

Motors For All Types of Applications

1/1800 to 1/35 H.P.

See Our Catalog in **SWEETS** 7a-Gen (S) or write for copy

Quantity Price Quotation On Request

THE GENERAL INDUSTRIES CO.

DEPARTMENT GN • ELYRIA, OHIO

Circle 99 on Reader-Service Card

• **SPACE VEHICLE COMPLEX** with a service tower as tall as a 17-story building is nearing completion at Cape Canaveral. Complex 36 is scheduled to go into service later this year for launching of the powerful Atlas-Centaur space vehicle.

The 173-ft service tower rests on 16 heavy railroad-type wheels mounted on tracks. A hydraulically powered rack and pinion system moves the gantry. A permanent 70-ft umbilical tower on the elevated launch pad is topped by two hydraulically retractable booms, which carry fuel, power and instrumentation lines to upper stages. The booms are withdrawn just before the spacecraft leaves the pad.

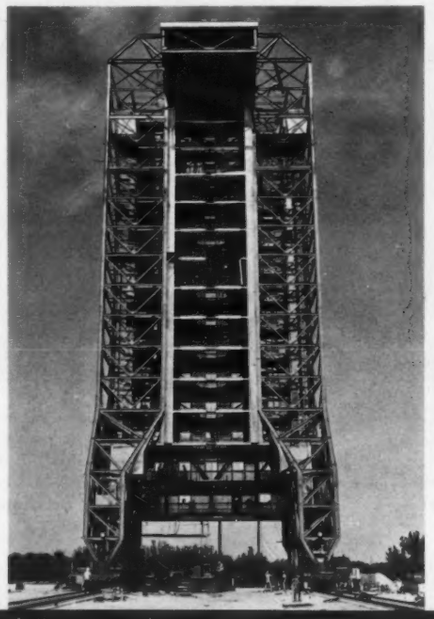
The launch and service building is constructed on two levels. The second level is needed to house unique servicing units, including a sophisticated fuel transfer system for Centaur's liquid hydrogen propellant. Aluminum is used extensively to forestall corrosion.

A "dry" flame bucket covered with "shot-crete" —concrete blown into place—juts out at a 45-deg angle. Only a small sprinkler system is needed. The angled flame bucket diverts exhaust heat from the gantry tower, which is rolled directly back from the launcher.

An above-ground cableway of walk-through design connects the blockhouse and the launch and service building. Technicians can make repairs in the tunnel-like passageway during the countdown without exposing themselves.

The blockhouse is built on two levels. The top level contains control consoles and a glass-enclosed booth for official visitors. Below is additional launch service equipment, as well as a crew ready room.

The complex was constructed under direction of the Air Force Ballistic Missile Div. Launching will be conducted by Convair Div. of General Dynamics Corp., builder of the Centaur.



PRODUCT APPLICATION

HANSEN SYNCHRON TIMING MOTORS

CLOCK PROGRAMMING

systems

using reset clock movements powered by Hansen SYNCHRON motors

MINNEAPOLIS-HONEYWELL REGULATOR COMPANY incorporates Hansen SYNCHRON Clock Movements in its Indicating Clocks and Master Control Systems — for installation in schools, public buildings, in industry, or wherever accurate time must be maintained. Single-dial Indicating Clocks are coordinated by Master Clock Programming, with automatic correction — to compensate for deviations caused by current fluctuations — available either on an hourly or 12-hour correction basis. Hourly correction resets the clock which may be from 55 seconds fast to 59 minutes slow depending on current fluctuations, at two minutes before the hour. The 12-hour correction occurs between 5:00 and 5:30 o'clock, automatically resetting clocks up to 12 hours slow.

HANSEN SYNCHRON CLOCK MOVEMENTS were chosen by Minneapolis-Honeywell because of satisfactory power and dependability experienced by a previous supplier to the firm. Hansen SYNCHRON motors are connected to reset movements through a gear, clutch and cam arrangement. The clock systems operate with 60-cycle and 24-volt motors, on 115-volt current — generally most readily available on typical installations.

SEND TODAY for informative folder containing specifications and technical data on all Hansen SYNCHRON motors and clock movements.

HANSEN MANUFACTURING COMPANY, INC.
PRINCETON, INDIANA

HANSEN REPRESENTATIVES:

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Los Angeles, Calif. — (OLive 1-3220)
Oakland, California

WINSLOW ELECTRIC CO.
New York, N.Y. — Essex, Conn. (SOuth 7-8229)
Philadelphia, Penn. Cleveland, Ohio

Sweet's Product Design File (S)

Circle 100 on Reader-Service Card for more information

• **ABLATIVE SKIRT** on the bottom half of the thrust chamber of a second-stage rocket engine minimizes pre-launch preparations by allowing a "dry jacket" start of the engine. Earlier engines had "wet jacket"-type thrust chambers, which meant that prior to flight the fuel used for regenerative cooling had to be pumped through the hollow stainless-steel tubes which form the thrust chamber.

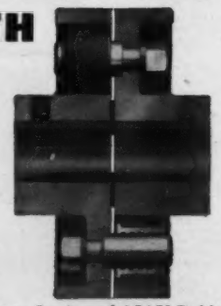
In order to eliminate this step and maintain the proper starting sequence, it was necessary to reduce the volume of fuel needed to fill the thrust chamber tubes. The top half of the thrust chamber provides the essential regenerative cooling, but the bottom half is a tubeless ablative skirt.

Twin-barreled, first-stage Aerojet-General engine used in recent Titan research and development flights has featured "dry jacket" starts without ablative skirts, which is possible because of the difference in configuration and starting sequence. Tubes of the first-stage engine are filled during the starting sequence by special phasing of the oxidizer and fuel-thrust chamber valves.

The ablative skirt is manufactured by Aerojet's Structural Materials Div., Azusa, Calif.

ABLATIVE SKIRT over 13:1 to 25:1 area ratio of second-stage engine for Air Force Titan. Skirt allows "dry jacket" altitude start to minimize pre-launch preparations and to preclude possibility of contamination of engine compartment by fuel leakage during first-stage missile operation.

DYNAMOMETER TESTING TIME SAVED WITH AJAX FLEXIBLE COUPLINGS



Cross Section of AJAX Rubber-Cushioned, Sleeve Bearing Coupling.

Hours are saved by one of America's foremost motor manufacturers because of the quick hook-up made possible by AJAX Flexible Couplings. Their quick connect and disconnect provides practically instant engagement and disengagement between motors and dynamometers.

AJAX Rubber-Cushioned, Sleeve Bearing design also saves line-up time and eliminates end-float problems. Motors being tested range from 40 to 150 HP.

Write for complete information on AJAX Rubber-Cushioned and Dihedral Gear Type Couplings.

AJAX

AJAX FLEXIBLE COUPLING CO. INC.
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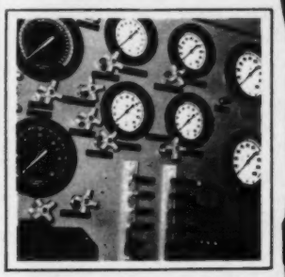
Made right on-the-spot with a DYMO TAPEWRITER using patented DYMO EMBOSSING TAPE

in 8 CODING COLORS



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Five models from $34.95

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not
just balls
but
precision
balls
made from
many
materials
with
finer
finishes
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tolerances

Don't let our name
Hartford Steel Ball confuse you.
Yes, we make steel balls,
but more than that we have
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balls that meet the exacting
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at your service. There are
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your company letterhead and
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Specify Hartford PRECISION BALLS & BEARINGS

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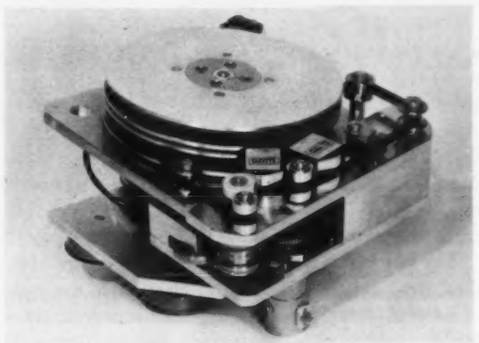
Jefferson Ave., West Hartford, Conn.

• **MINIATURE MAGNETIC TAPE RECORDER/REPRODUCER** for satellite and missile applications is capable of operating on 1/20 of the power previously considered practical. Power consumption is rated less than one watt and size is expected to approximate 100 cu in when the design configuration is finalized. The unit has an estimated life of at least 4000 hr, operates at a reproduce-to-record speed ratio of 18:1 (ratios up to 100:1 are feasible) and weighs less than six lb. Presently, the unit will record for approximately 2½ hr at 1 ips and play back in about eight minutes. Reproduce frequency ranges from 1 to 25 kc.

Power economy has been achieved by a d-c motor for primary drive which uses rolling rather than sliding brushes. The brush design not only reduces friction, but also increases brush life. Low brush life has been one of the principal objections to the use of d-c motors in satellite recorders. An electronic system controls motor speed to better than ¼ percent, but consumes less than 40 milliwatts.

Additional power economy is obtained by using "Mylar" belts which have excellent "mechanical memory". They are much thinner than conventional belts and thus require less power to drive. Reel tension is maintained through the use of a special "Neg'ator" spring. The tape is driven around 270 deg of a silicone-rubber capstan to provide positive slip-free drive over the entire operating temperature. Class seven ball bearings further reduce friction and conserve power. A latching solenoid operates the speed-change clutch which uses power only while switching between record and reproduce speeds. The erase system consists of permanent magnets which require no power.

The miniature tape recorder/reproducer has been developed by Datalab Div. of Consolidated Electrodynamics Corp., a subsidiary of Bell & Howell Co.



DELAY RELAY? LOAD RELAY?

BOTH!

The Type A Silic-O-Netic Relay is a light, small time-delay relay. *It weighs a mere three ounces, gives you any delay you spec from 0.25 to 120 seconds. Keeps at it, too, for several million operations; the time-delay element cannot stick, bind, or wear.*

The Type A Silic-O-Netic Relay is a light, small load relay. *The continuous-duty coil does the trick. The Silic-O-Netic can be energized continuously, eliminating lock-in auxiliary circuits. Saves wire. Saves work. Saves space. Saves money.*

Here, then, is a time delay relay that doubles as a load-carrier. The Type A offers SPDT or DPDT switching, with contact capacity up to three amps. Consumes, at most, two watts of AC power, three watts of DC. Available for use on one of twenty standard AC and DC operating voltages, and on request, for others. Costs far less than the two relays you would need to replace it; well worth a closer look. Write for Bulletin 5003.

HEINEMANN ELECTRIC COMPANY

105 BRUNSWICK PIKE TRENTON 2, NEW JERSEY

SA 2377

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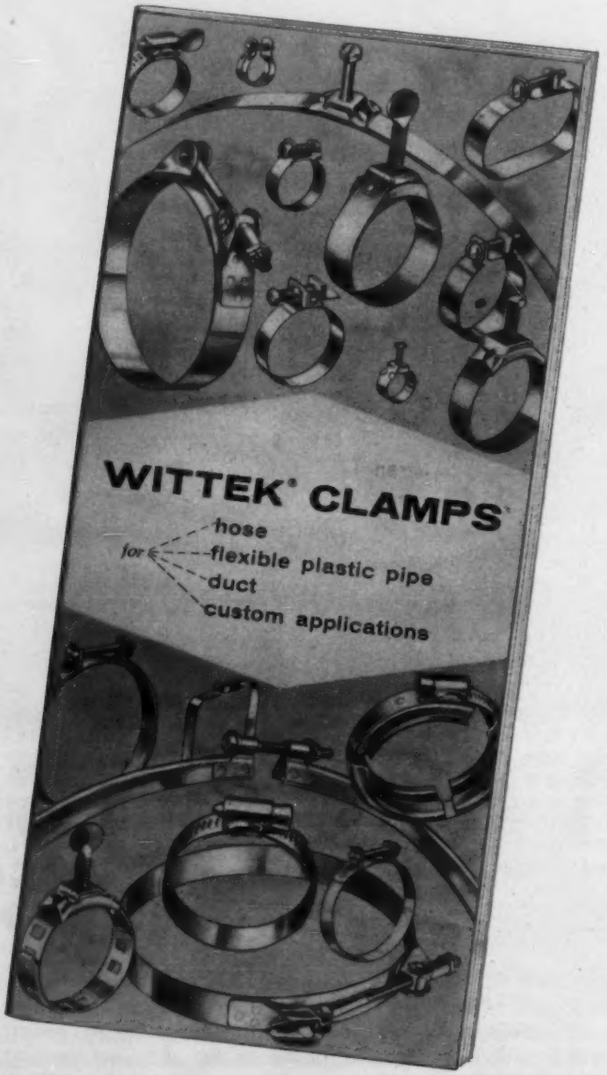
WHAT'S YOUR CLAMPING PROBLEM?



WITTEK has the answer . . .

Whatever your clamping problem, it's a safe bet that Wittek has the exact type and size clamp to do the job. Write for this new 16-page brochure on standard Wittek clamps and custom-made clamps.

Quality Clamps for Over 35 Years

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CLAMPS for Every Application

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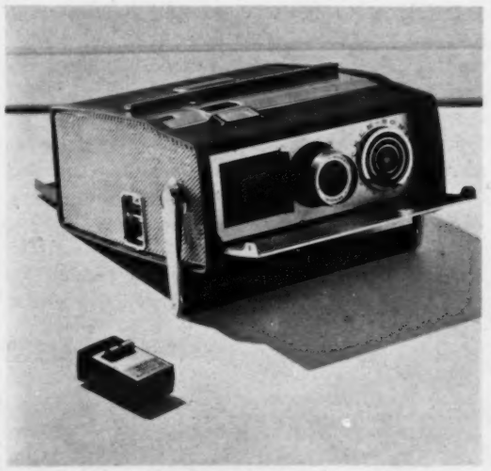
RELEASES

• **SLIDE PROJECTOR** uses ultrasonic sound waves to focus and change slides by wireless remote control. The remote control frees the operator to project from any point in the room. It operates from a distance of more than 40 ft.

The remote control has two miniature transmitters which vibrate and create sound waves in the same way as a tuning fork. One transmitter sends high-frequency waves at 26,500 cps for focusing. The other transmitter sends at 40,000 cps to change or advance slides. The transmitters are operated by two buttons on the remote control.

An ultrasonic receiving unit in front of the projector picks up inaudible sound waves and triggers focusing and slide advance mechanisms.

The remote control slide projector was announced by Bell & Howell Co.

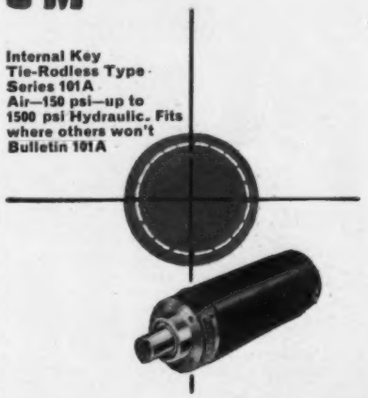


• **ULTRAVIOLET LIGHT PROTECTION** can be obtained through a new optical black-anodizing process. The technique calls for the use of a special black dye and a new sealing process. Parts are sealed to give assurance against fade. After processing, each part must stand up to a thorough inspection by a gloss meter which records the uniformity of light refraction.

The black-anodizing process, developed by Anadite, Inc., South Gate, Calif., eliminates the possibility of erroneous readings of recording electronic oscillographs because of light infiltration.

Precision Parts Assure Precision Performance from O-M Cylinders!

Internal Key Tie-Rodless Type Series 101A Air—150 psi—up to 1500 psi Hydraulic. Fits where others won't Bulletin 101A



ALL O-M CYLINDERS MEET JIC STANDARDS

With all matching parts and mounts machined to close tolerances, O-M Air and Hydraulic Cylinders eliminate misalignment friction, unnecessary wear on rod, bearings packings, also reduce maintenance, when operated singly or in sequence under automatic cycling. The length and direction of piston rod travel is accurately controlled whether the job calls for moving a machine member, holding a tool, positioning, clamping, releasing a work piece, activating an indexing table or other applications. In addition, precise cushioning against piston shock on thrust and return strokes makes for smoother, dependable operation.

O-M Cylinders are available in a complete range of sizes (1½" to 8" bores) with standard or heavy-duty rods. Complete line of interchangeable parts and mounts. Immediate delivery on most sizes.

If you are designing air or hydraulic cylinders into original equipment for precision control of linear motion, coupon below will bring our latest bulletins showing construction and dimensional details, engineering drawings, capacity chart and mounting data. For your copies, **MAIL COUPON TODAY.**

Bulletin 101A for Internal Key Tie-Rodless type Air and Hydraulic Cylinders featured above.

Bulletin 105A—Improved Tie-Rod (Heavy Duty) Cylinders Hydraulic 2000 psi; 3000 psi non-shock.

Bulletin 107—Automation (Heavy Duty) Air Cylinder for 200 psi operation.

Bulletin 108—Automation (Heavy Duty) Hydraulic Cylinder—for 1000 psi operation.

ORTMAN-MILLER MACHINE COMPANY
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Send Bulletins

☐ Have representative call ☐ 101A ☐ 107 ☐ 105A ☐ 108

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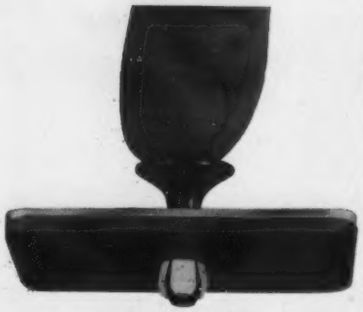


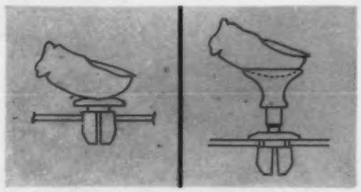
introducing

NYLATCH®

Nylatch, a new push-pull fastener, is now offered off the shelf to industry needing the ultimate in dependable low cost fastening.

Nylatch will replace most existing fasteners for metal, wood and synthetics yet gives these outstanding features—

- Less than 10 seconds installation—merely insert grommet into material to be fastened and insert plunger in grommet.
- Standard punched or drilled holes accommodate Nylatch.
- Nylatch allows up to .040 misalignment tolerance.
- Rugged two-piece construction gives 30,000 complete cycles of operation. Thoroughly tested for temperature, creep characteristics, fatigue and load.
- Versatility of design allows you a selection of plunger head designs. Available in wide range of decorator colors.



Press grommet into removable sheet | Press plunger into installed grommet

Your inquiry will bring complete information.

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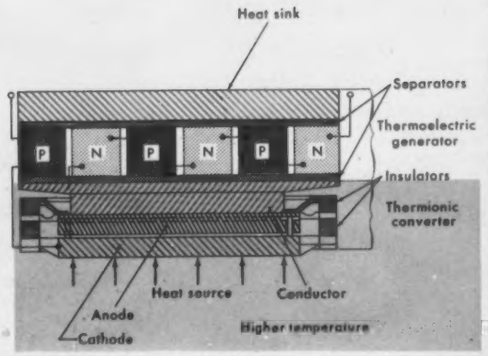
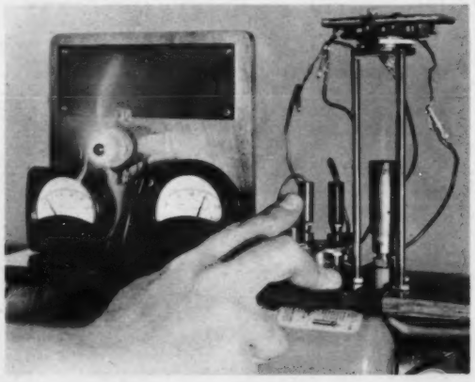


CROSS-SECTION of thermionic-thermoelectric energy converter. Device can be held in palm of hand.

• **COMBINATION THERMIONIC-THERMOELECTRIC ENERGY CONVERTER** produces twice as much power as a thermionic converter alone, without additional heat input. Using "waste" heat rejected by the thermionic converter, a thermoelectric generator (essentially a thermocouple) produces the additional power. The new device takes advantage of the fact that thermionic conversion is most efficient at higher temperatures while a thermoelectric generator works best at relatively lower temperatures.

Studies indicate that efficiencies of 16 percent and better may be attainable by using vapor thermionic converters operating at a cathode temperature of 1325C. These are cascaded with lead-telluride thermoelectric generators, operating at a hot-junction temperature of 650C.

The energy converter was developed by General Electric Co.



ENERGY CONVERTER is perched above heat supply on tripod at right. Power from thermionic converter (bottom of sandwich) is running propeller while power from thermoelectric generator is indicated by instrument needles.

EMCOR® Standard Cabinets

offer more

EXTRA

advance design and quality construction features!

EXTRA — 7" high, 16 gauge steel center strut for ease of equipment mounting and greater over-all structural strength.

EXTRA — 14 gauge steel frame construction assures greater ruggedness and rigidity.

EXTRA — Electronically controlled spot welds assure superior strength.

Jig assembly line fabrication provides rigid quality control and assures compatibility of frames.

EXTRA — Key Heliarc* Welds provide for greater structural rigidity.

EXTRA — Continuing research and development by the Roy C. Ingersoll Research Center maintains EMCOR leadership in metal cabinetry.

*Registered Trademark Linde Air Products Co.

From single cabinets to major systems, the hundreds of basic frames of the EMCOR Modular Enclosure System meet your height, width, depth and structural enclosure needs.

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Originators of the Modular Enclosure System

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Division of Borg-Warner Corporation
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BORG-WARNER

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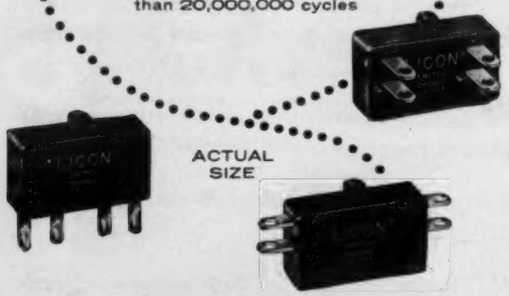
You've never seen a SUB-MINIATURE switch as mighty as this

BIG switch performance in sub-miniature size

Rated 10 amps 30 V.d-c. Inductive (L/R- .026). Consistently more than 20,000,000 cycles



NEW LICON® TYPE 16 SWITCH measures only 25/32" long and ¼" thick but packs quality and dependability never before achieved in sub-miniatures. With characteristics found only in much larger precision switches, the Licon Type 16 is ideal for aircraft safety applications, has performance and size vital to guided missiles. Passes Navy 1300 G shock test . . . exceptionally shock and vibration resistant even near the trip point. Its new switch mechanism with stainless steel springs avoids early fatigue and provides the advantages of double break contacts with wiping action in a wide range of movement differentials and operating forces.

WRITE FOR FREE LICON CATALOG

Engineering data, characteristics, modifications . . . write for new catalog with complete information on the new Licon broad line, featuring the Type 16 Sub-miniature Switch.

LICON

Switches and Controls

Division of Illinois Tool Works
6606 West Dakin Street, Chicago 34, Illinois

itw

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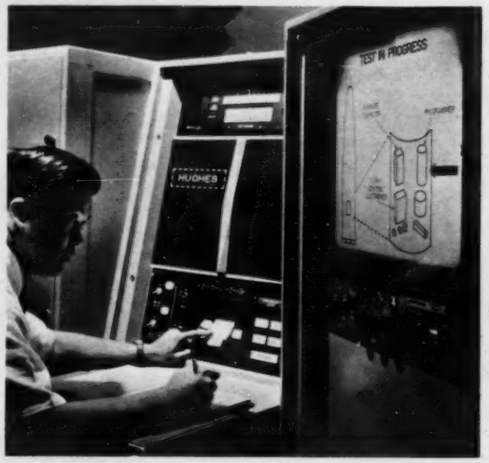
RELEASES

• **AUTOMATIC ELECTRONIC ANALYZER** will predict the operational readiness of an intercontinental ballistic missile or any other complex weapon system. The new machine is called D-PAT (Drum-Programmed Automatic Tester). Using a digital computer with test program procedures stored on a magnetic memory drum, D-PAT detects and isolates malfunctions in any system down to the smallest replaceable unit or assembly.

With its memory drum whirring at 2300 rpm, D-PAT electronically clicks through a system checklist, confirming its own measurements with known values stored on the drum. It automatically starts exploring to investigate a suspected trouble spot. If a malfunction is detected that could cause an unsafe condition, D-PAT "declares an emergency" and automatically shuts down the system.



Then, dipping into its library of 35-mm slides, D-PAT flashes repair instructions on a 15-inch view screen, displaying a picture of the malfunctioning circuit or assembly with a bright red arrow spotted over the component that is causing the trouble and needs replacing. D-PAT also will predict the remaining useful life of a component by comparing its operation with its past performance and with the manufacturer's specifications. If the component appears to be breaking down, it can be replaced before it causes a system failure.

D-PAT will test any electronic system anywhere —at an ICBM launching site, in the operations control center of a naval fleet at sea or at any Army field maintenance station behind the battle line. D-PAT was developed by Hughes Aircraft Co.

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The device was developed by Electro Nuclear Systems Corp., Minneapolis, Minn., for the Bureau of Medicine and Surgery of the U. S. Navy.

Meetings

St. Louis, Mo. Apr. 4-6	EXHIBIT of Progress in Electrical-Electronic Equipment, Kiel Auditorium.
New York, N. Y. Apr. 4-6	INTERNATIONAL SYMPOSIUM on Electromagnetics and Fluid Dynamics of Gaseous Plasma, sponsored by the Institute of Radio Engineers, Institute of Aerospace Sciences, Polytechnic Institute of Brooklyn, et al.
Los Angeles, Calif. Apr. 4-7	ANNUAL SPRING CONVENTION of the Audio Engineering Society, Ambassador Hotel.
New York, N. Y. Apr. 4-7	NATIONAL AERONAUTIC MEETING, Production Forum and Engineering Display, Society of Automotive Engineers, Hotel Commodore.
Palm Springs, Calif. Apr. 5-7	MEETING of the American Rocket Society on Lifting Reentry Vehicles: Structures, Materials and Designs, El Mirador Hotel.
New York, N. Y. Apr. 6-7	MANAGEMENT ENGINEERING CONFERENCE, sponsored by Society for the Advancement of Management and American Society of Mechanical Engineers, Statler-Hilton Hotel.

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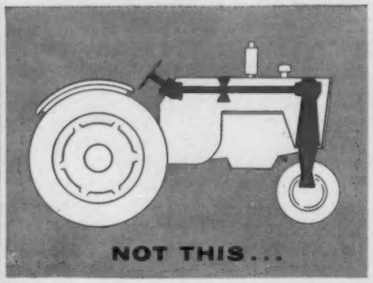

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SLOW DOWN—SPEED UP

From 1955 to 1958 the earth slowed down, but since that time it has speeded up again.

The change of rotation speed, however, was so slight that photographic-zenith telescopes were needed to determine the time change, according to Dr. William Markowitz of the U. S. Naval Observatory.

The earth slowed down by one-thousandth sec between 1955 and 1958 and sped up since then by three-tenths of a thousandth sec. The findings were based on comparison of atomic time with time based on the rotation of the earth. The changes in the earth's rotation speed occur gradually and not suddenly.

Observations of the moon for the past 300 years have shown that the rate of the earth's rotation varied. Until the construction of a very accurate atomic clock, however, it was not possible to determine if the changes in speed were sudden or gradual.

Smelling Your Way to a Solution

Investigators of the human nose have produced a novel aid to designers of ships, aircraft and other vehicles: an electrical way of making fields of flow visible.

W. Pitts and B. Howland of the research laboratory of electronics at Massachusetts Institute of Technology developed the apparatus during studies of olfactory stimulation. Their apparatus enables engineers to see, photograph and measure turbulence caused by a wing, a cylinder or whatever else they wish to study.

The builders had set out to devise a model of what happens in the human nose when chemical information is turned into electrical information for transmission to the brain. During this effort, they looked into electrochemical effects of fluid motion past an electrode. By placing luminescent chemicals in a solution and moving an anode through it, or permitting the solution to flow past an anode, it was found that some of these chemicals can be triggered into glowing.

Mr. Howland has obtained such impressive pictures of fluid motion that artists as well as engineers are interested in his technique.

Wind and Water versus Atom Bombs

Weather men are dealing with tremendous energies when they tackle storms, according to Dr. F. W. Reichelderfer, chief of the U. S. Weather Bureau. To back up this statement, he notes the following:

(1) In one year, winds carry energy equivalent to about 2 billion atom bombs across the 40-deg latitude.

(2) The January storm that hit New York dumped about 40 million tons of snow. If the snow could have been melted to rain by applying heat, it would have required the heat equivalent of 120 atom bombs.

So, then I thought as long as we were going to have lunch together anyway, why not mix business with pleasure?

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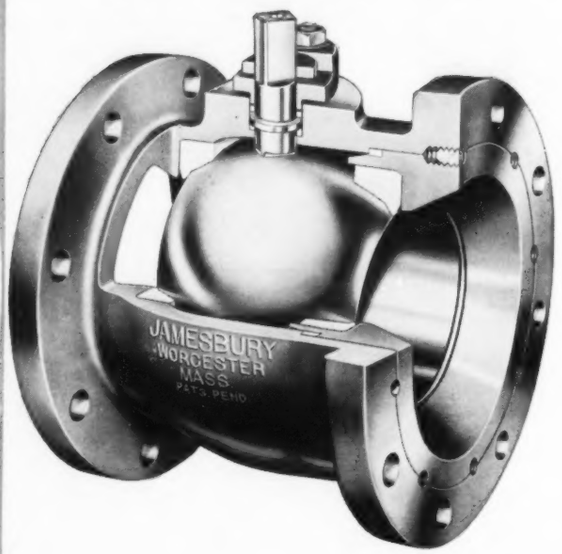
"Double-Sure"

Outline for Successful Valving



Jamesbury
BALL VALVES*
*PATENTED

As Versatile As Industry Itself!

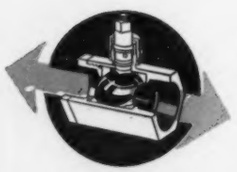
The words "Double-Seal" have delivered a new concept of valve dependability and performance. The exclusive "Double-Seal" design means complete shut-off on BOTH sealing surfaces of the ball. Because of this action the valve will hold pressure equally well in either direction.

In long term high-cycling through a wide variety of applications, the "Double-Seal" Ball Valve has proven virtually maintenance free.

For maximum leak-proof performance, full flow and easy quarter turn operation, the Jamesbury "Double-Seal" Ball Valve is a proven leader.

Send for Jamesbury's "At Your Service" Literature

JAMESBURY CORP.,
74 NEW STREET, WORCESTER, MASS.



MATERIALS:

DISTRIBUTORS IN PRINCIPAL CITIES

Jamesbury "Double-Seal" Ball Valves are available in Types 303, 316 and Alloy 20 Stainless Steels, Carbon Steel, Bronze, Ductile Iron, Monel, Aluminum and PVC. Other materials on special order.

Interchangeable seats and seals are available in "Teflon", Nylon, Buna-N, Neoprene, Hypalon and natural rubbers.

Pneumatic, Hydraulic and Electric Motor Operators to fit Remote Control Requirements.

SIZES:

Screwed End: ¼" through 3". **Flanged:** 150# series — ½" through 12", 300# series — ½" through 8"*.
*10" and 12" on application *600# series on application.

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